THE AMERICAN SCHOOL AND UNIVERSITY

A YEARBOOK DEVOTED TO THE DESIGN, CONSTRUCTION, EQUIPMENT, UTILIZATION, AND MAINTENANCE OF EDUCATIONAL BUILDINGS AND GROUNDS

1930–1931

THIRD ANNUAL EDITION

PUBLISHED BY THE

AMERICAN SCHOOL PUBLISHING CORPORATION

443 FOURTH AVENUE, NEW YORK

Printed in the United States of America by
J. J. LITTLE AND IVES COMPANY, NEW YORK

Foreword

By RAY LYMAN WILBUR

Secretary of the Interior; President, Stanford University

THE foreign visitor to many American communities is apt to comment most favorably upon the attractive school buildings which have been developed in the last few decades. They are the crown of American civic life. Although they only provide the shell for our educational mechanism, every element of their construction is vital from the standpoint of finance, convenience, time-saving, health, and those subtle but important influences that come from the environment.

THE problem of the rapidly extending range of American education demands constant thought and vigilance regarding every phase of school building. I am impressed more each year with the importance of setting aside the proper areas in the community for school purposes, and of planning the facilities created on these areas with the greatest of care. The responsibilities of the school as it more and more supplants the home must include recreational opportunities. At the same time the school is becoming more and more a center for our community life, both for children and for adults. Auditoriums and meeting places have become a normal part of many school systems. Many of the high schools of today have more expensive and better equipped plants than most of the colleges and universities of twenty years ago. The various student activities, such as journalism, require special handling. The bringing-in of vocational training requires the most careful preliminary planning.

The tendency to fit the training in the school to the individual's capacity to accept it, is leading to certain segregations of students, the development of such institutions as the junior high school, and the need of equipment suitable for the special problem to be met.

IN going over the outline of THE AMERICAN SCHOOL AND UNIVERSITY, I am impressed with the practical observations made in these special articles and upon their timeliness for those who are thinking in new terms of the American school. The little red schoolhouse belongs among the antiques. School means much more than simple classroom drill and training.

We need a clearing-house of information on the practical phases of these various school questions. This often needs to be worked out in a departmental manner along the lines of the article by Emeline S. Whitcomb, on Plans and Equipment for Home Economics Departments. It seems to me that the plan of this Yearbook which focuses the attention of architects, educators, librarians, specialists in the various fields of education, builders, and others upon the American educational institution will render a high and important service in the future of general education in America.

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Section I

BROAD PROBLEMS OF EXPANSION AND ECONOMY

Why 1930–1931 Should Be a Record-Breaking School-Building Year

BY GEORGE DRAYTON STRAYER

PROFESSOR OF EDUCATION, TEACHERS COLLEGE, COLUMBIA UNIVERSITY

THE need for new school buildings was never greater than at the present time. During the past few years the school population, particularly at the junior and senior high school levels, has been rapidly increasing. The majority of communities have not yet provided adequate facilities for this part of the school program.

New, Well-equipped Buildings Greatly Needed

It is only within the period of the past four or five years that the program of the junior high school has been sufficiently well defined and often enough tried out to give confidence to boards of education in the development of plans for this unit of the school system. We appreciate now as we never did before the need for buildings with unusual equipment to carry out the junior high school program. Libraries, gymnasiums, shops and laboratories, differing in many respects from those of the senior high schools, are a necessary part of the plant of this type of school. In a like manner, the developing program of the senior high school has rendered obsolete many plants now in use.

But the biggest single demand is that of increased attendance. For the first time in the history of the country, the number of boys and girls of high school age who are in attendance upon our secondary schools has passed the 50 per cent mark. There is every indication that this large enrolment will be still further increased.

Fire Hazards in School Buildings

On the elementary school level we face the need of an unusual amount of construction, because of a better realization of the inadequacy of our present school buildings. Specialists in school administration and school construction have made surveys in many communities throughout the United States and have revealed most deplorable conditions. In the older communities one often finds from one-fourth to one-half of the whole number of children housed in buildings which have long outlived their usefulness. In many cases these children are attending school in structures in which the fire hazard is one that no community thoroughly conversant with the situation would be willing to face. Many of these older buildings are of wooden joist construction, without any fire-resistive walls and with highly inflammable wooden stairways. In many cases there is even little protection from the danger of fire arising from the heating plant. It is only in unusual cases that the basement and stairways are sprinkled.

In many communities people have been lulled into a false sense of security by placing outside fire-escapes on their school buildings. They fail to realize that in case of fire these exits may have little or no significance. Often they are difficult to walk upon, and in very many cases windows without wire glass open directly on or under the fire-escape, which would render such means of exit unavailable. The greatest danger, however, in a non-fireproof building is from panic. It is only when completely fireproof stair wells, shut off from other parts of the building by fireproof partitions and doors, are available, that these older types of buildings offer a reasonable degree of safety.

Poor Lighting

Thousands of school buildings are in use throughout the country in which children suffer from eyestrain because of inadequate day-lighting. Windows are not infrequently of insufficient area and are commonly misplaced from the standpoint of providing light to the school desks in use by the children. In extreme cases one still finds light entering from the front of the room. In a great many cases windows are so placed toward the front end of the room that children working at the blackboard must look directly into the light.

The older buildings are not often provided with satisfactory artificial lighting. In many cases no artificial lights have been installed, and in others

the light furnished varies from a glare upon one desk to a fraction of the light necessary in some other part of the room. One of the most harmful procedures is that of hanging exposed, high-powered bulbs where children's eyes are constantly strained by virtue of the necessity of looking into these bright points of light when they look toward the teacher or read from the blackboard.

Insanitary Arrangements

In many of these older buildings the sanitary arrangements are most unsatisfactory. Drinking fountains are either absent or of a type that encourages the spread of contagion. Floors and walls are in such condition that it is almost impossible to clean them. Toilet facilities are to be found in dark basements and in unsatisfactory condition. Certainly, in many cases, if parents were entirely familiar with the schoolhouses in which their children are taught, they would insist upon the community's making an investment in new buildings and equipment.

Inadequate Interior Facilities

Possibly the greatest deficiency in elementary school buildings planned a generation or more ago is the lack of those special facilities which are required by a modern school program. It is the exception to find an adequate auditorium on the ground floor. In some cases, assembly rooms have been built on the second or third floors, with inadequate exits. These present an extreme fire hazard. In many cases the use of them ought to be abandoned. It is seldom that one finds satisfactory gymnasium facilities. Here, again, in some of these older structures, the facilities provided are almost worse than useless. It is not uncommon to find in the buildings that were more ambitiously planned, a hole under the buildings, poorly lighted and ventilated, damp, dark and dismal, called a gymnasium. But if facilities in these respects are lacking, it is even more true that there has been little or no attention given to the need for libraries, for music, science, and shops.

Playgrounds Needed

But if the schoolhouses themselves are inadequate, it is even more true that the sites upon which these older buildings stand were bought without any relation to the modern play program which we associate with all types of schools. Many communities can secure a part of the funds necessary for the purchase of sites of buildings by selling the very limited sites often located in the older business section of the city. But, whether this be true or not, it is of greatest importance that if new buildings are constructed, play facilities be provided for all the children. This will involve a minimum of five acres of land for an elementary school, ten acres for a junior high school, and twenty acres for a senior high school.

Costly Maintenance of Old Buildings

There is another reason why this greater activity in school building should occur at this time. Studies that have been made in recent years give clear evidence of the high cost of maintaining old buildings. There are authentic cases in which it can be established that as much as one-half of the interest charge involved in the capital outlay necessary for the building is today being spent on maintenance of inadequate structures. These older buildings must have new roofs, new plumbing, new sanitary features; they must be reconstructed in certain major particulars if they are to be continued in use. By far the better investment for the community is the abandonment of the old structures and the development of a building program that will provide modern housing for all children.

To Relieve Unemployment

There must be added to this consciousness of the need for new schoolhousing, the desirability of unusual measures in all public work to take care of the unemployment situation. The President of the United States, the governors of the several states, city mayors and other local officials, have agreed that it is economically sound and socially desirable to carry forward, at the present time, an unusual program of public works.

Good Value for School-Building Funds

Boards of education that develop a building program at the present time will have the advantage of a favorable market. More value for the money expended can be had in the immediate future than at any other recent time. An unusual investment in school buildings will, on this account, bring to the people greater value than would a more conservative plan extending the building program over a longer period.

For all these reasons, then, it seems probable that the year 1930-1931 will see unusual activity in schoolhouse building. The need was never before so great. Increased enrolments will undoubtedly continue to make a larger and larger demand for new facilities. Inquiries that have been instituted throughout the United States have brought home to the people the dangerous conditions now existing in many school buildings. The popularization of the modern program of education has given to the man in the street a better appreciation of the need for more and better housing and equipment than was formerly provided. The extravagance involved in maintaining old structures is evidence in support of the wisdom of investing in new schoolhouses. Adding to all these the need for relief of unemployment, surely it is reasonable to propose that the year immediately ahead shall see unusual activity in the school-building field.

Convenience and Beauty in the Grouping of Buildings on a College Campus

BY ARTHUR HAWTHORNE CARHART
McCrary, Culley & Carhart, Landscape Architects

TO some the idea of a landscape plan for a campus suggests nothing more than a planting plan for growing things. But to those who speak of campus planning in its broadest sense, a master plan for the campus considers primarily and directly efficiency, good organization of elements, basically sound design for use. Beauty will come readily if the campus is well organized; it usually is impossible to bring anything but superficial adornment to a campus that lacks a well-articulated skeleton.

Fit the Plan to the Topography

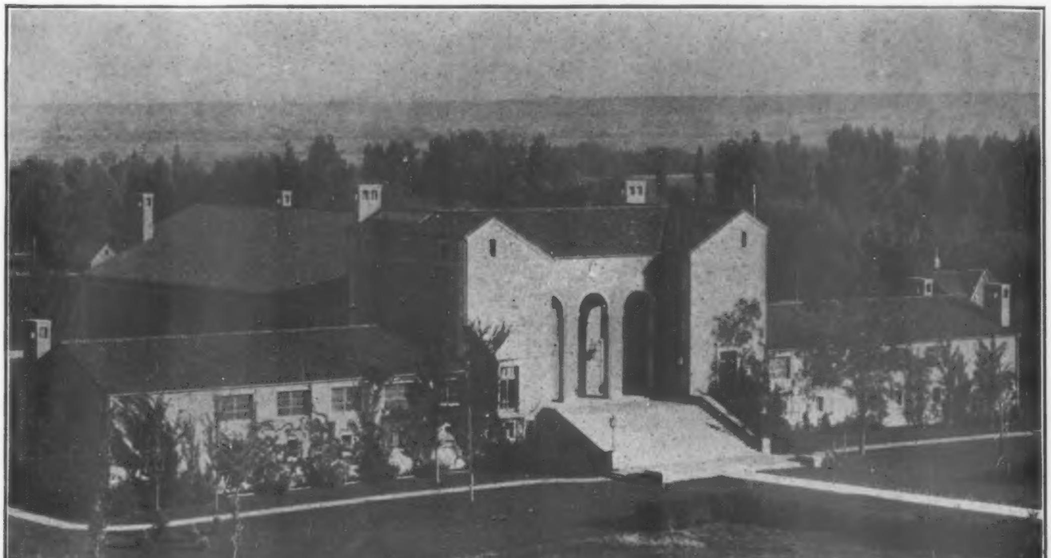
The topography of the land on which the campus is to be developed is a basic factor in design. At the University of Utah the slope is uniform, about 6 per cent toward the west. Buildings constructed facing north or south would have one end sunk in the ground, the opposite end sticking out of the ground in an awkward manner. The plan must take cognizance of this constant westerly slope.

At Culver-Stockton College, Canton, Mo., which is on the bluffs of the Mississippi River, the topography absolutely dictated an informal building grouping. To try to put a geometric scheme on this topography would have involved moving little mountains of earth. This primary grouping of buildings to fit the ground had a decided influence on the beauty of the campus.

Consider the Type of School

Then there is the fundamental factor of what type of training the school is going to offer. At the New Mexico Military Institute, Roswell, N. Mex., the campus is flat. There are no topographic problems involved. But the school makes rugged outdoor physical training an important part of the regular school work. Here there was a demand for extensive plans for an efficient, interesting athletic plant. At the other extreme, where no athletic fields are involved, would be such a grounds plan as some half-dozen large sanitaria have required.

The campus organization requirements of a liberal arts school will be different from those of a state mechanical and agricultural college. The courses offered are not the same. The use relationship between the agricultural engineering laboratory building and a chemistry building is different from that between a library and a building housing a school of theology.



MEN'S GYMNASIUM, UNIVERSITY OF COLORADO
The terminus of a campus vista

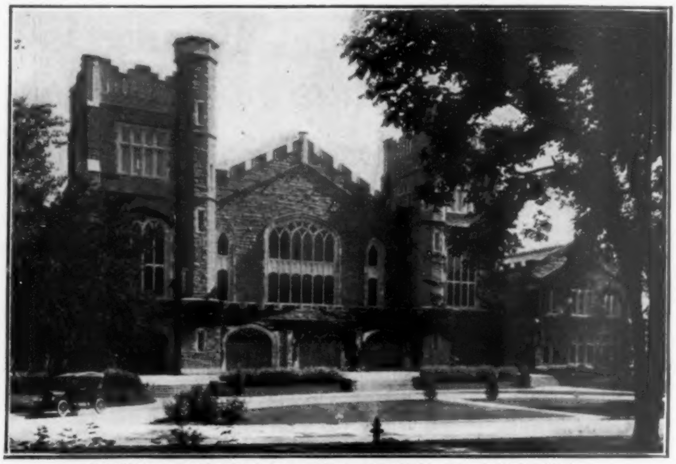
The use to which the building will be put; to some extent the form the building will take to meet that use; the traffic, both pedestrian and vehicular, which will originate at and travel toward that building; the amount of service trucking which such a building will require; the interlocking of class schedules in that building with adjacent or distant buildings, all have their bearing on the making of a sound master landscape plan for a campus.

The Use Plan

The landscape designer specializing in this field of institutional grounds planning therefore strikes first at this use plan; at a plan which embodies good articulation of the skeleton scheme. He deals first with the relationship of buildings to buildings, of masses to masses; with the relationship of building masses to open spaces; and of open spaces to open spaces. Those open spaces may be athletic fields; they may be central campus; or they may be test plots or field laboratories for farm machinery; but the efficiency with which the school will function, the ease with which it will be administered, are directly linked with getting the soundest use plan, the most efficient basic arrangement consistent with all factors involved.

This phase of the master plan of a campus is generally a compromise. It involves weighing the value of one scheme of future development against another. There are many conflicting demands. The final plan is always the result of an inclusive consideration of *all* factors involved and the development of the scheme that most nearly will meet all the requirements.

We often find buildings located on an established campus. They have been located with several factors fully weighed. But they have not been located with *all* factors fully surveyed and balanced. In fact, on one campus, it was the mislocation of a $75,000 building which induced the board of that institution to secure campus plan studies. That build-



MACKAY AUDITORIUM, UNIVERSITY OF COLORADO
Showing main campus drive and plantings

A CORNER OF THE LAKE, UNIVERSITY OF COLORADO

ARTS BUILDING, UNIVERSITY OF COLORADO
Showing adequate foreground and well-arranged plantings blending the building mass with the setting

ing will never fit into any ideal scheme. But future buildings on that campus will fit into the best scheme possible, all factors considered.

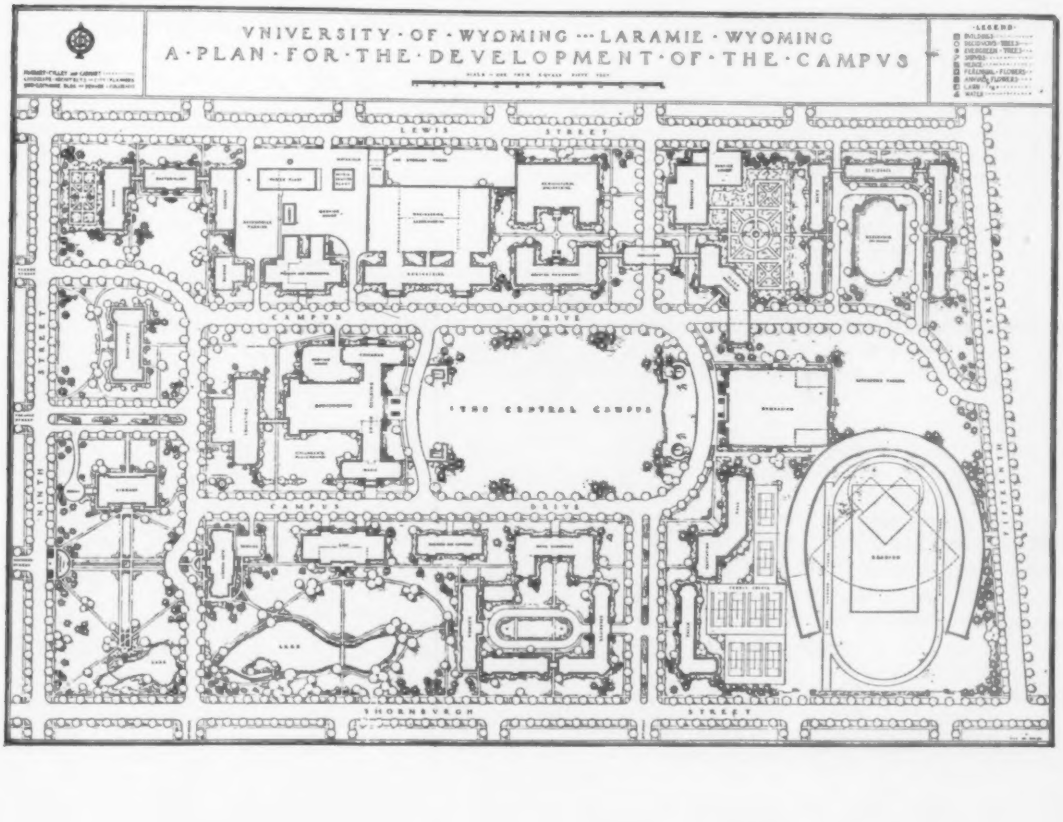
The ideal condition for preparing a master plan for a campus is to have an open field, ideal topography, and adequate funds for building the campus as planned. Actually, the ideal is rarely approached. The making of a master plan for a campus with a half-dozen existing buildings which must be articulated to the best advantage to the rest of the scheme is the usual problem facing the campus planner.

Colleges and universities apparently must reach this stage before they realize that they need some general plan to follow. So, usually, there are badly located buildings before the master plan is invoked. But it is significant that in developing more than thirty institutional grounds plans no existing building of a permanent nature has ever been junked outright in the planning program, and even temporary buildings have been allowed to remain for their full life of usefulness. Any one can make a good campus plan if buildings can be junked indiscriminately. But it is an acid test of a good plan to save all good existing buildings and still get a good plan for the particular development.

A VIEW OF THE CENTRAL CAMPUS OF THE UNIVERSITY OF COLORADO

Planning for a Long Future

The master plan drives toward a 25- or 50-year program. In that time many old buildings will have been junked. The campus will be largely rebuilt. With a master plan to follow, the future



LIBRARY, UNIVERSITY OF WYOMING

campus can be molded toward long-time objectives. A good master plan will recognize these inevitable changes and make the most of them.

It is perhaps more important that a college with several existing buildings (one or two in the wrong place) should procure a campus plan to follow than should the college with a campus which is built without such limiting factors already existing. It is easier to make errors where plans are lacking and the development comes haphazard and piecemeal over a term of years, than if the college is to be built outright on a piece of land where there are no existing buildings in the wrong locations.

Making the master plan on which an institution will develop for years to come, on which some millions of dollars' worth of future improvements will be made, is not a process of quick magic. It is a process of grubbing after facts; study over pencil sketches; submission of those sketches to officials; revision, more revision, more study; more balancing of need against need; testing of soundness of design; until finally all angles of all problems are uncovered and met to the best judgment of campus planner and institutional official.

In this manner does the preparation of a master landscape plan for the future guidance of a school's development differ from some plan dealing only with the bedecking of the campus with the greenery of groups of growing things.

The Fundamentals of Convenience and Beauty

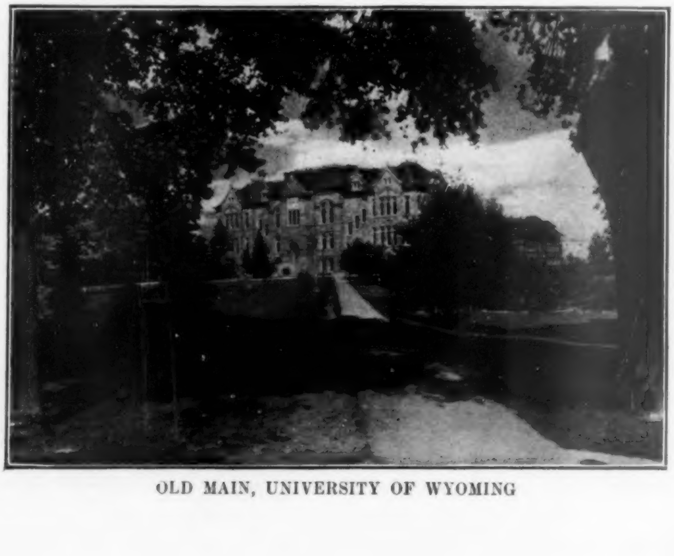
Master planning includes study and solution of the location of the heating plant with reference to other buildings, the grouping of all-college buildings, such as the library, the student union, and similar structures, so that they will be convenient to all parts of the campus, the proper location of housing units for dormitories, sorority and fraternity houses, the design of an adequate system of drives and walks so that every point of the campus will be accessible as required, but so that there will be no foolish excess of drives or walks to involve a large first cost and a future high maintenance.

Convenience and beauty both as part of a campus plan?

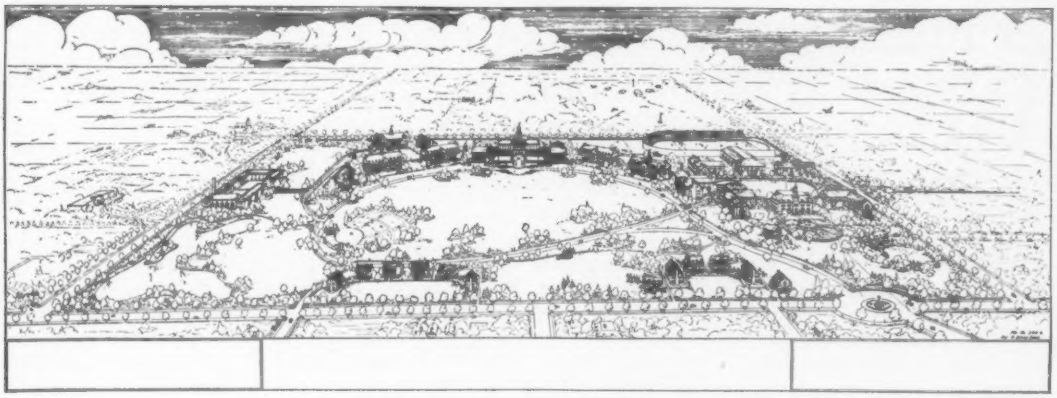
Assuredly. The essence of campus beauty lies in that basic planning which I have been discussing. The beauty of a building's architectural detail is directly dependent upon the forecourt from which it will be seen. The beauty of mass in a structure is dependent upon the handling of masses and proportion in other buildings and the open spaces surrounding them. The whole is dependent upon how well the structures are fitted to the topography.

And where is campus beauty if the materials yard, the steam plant, and the trash pile jam their way into the center of the scene; if they have not been properly located convenient to all the campus and yet out of the central campus views?

Master campus planning does for the entire campus—grounds, buildings, traffic lines, and plantings—what the architect does in designing the four walls of the building and the halls, rooms, plumbing, and light wires, within it.



OLD MAIN, UNIVERSITY OF WYOMING

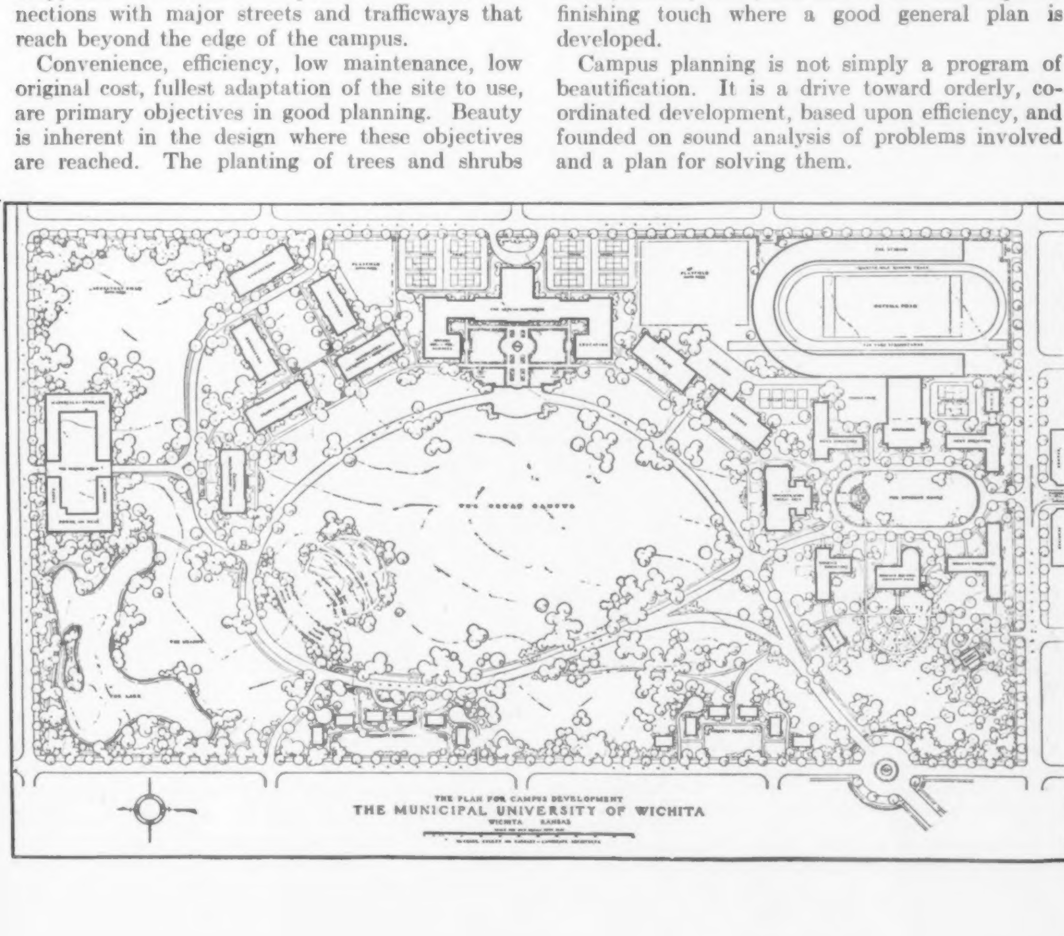


AIR VIEW OF THE UNIVERSITY OF WICHITA

There is a middle ground in which architect and landscape architect must work cooperatively to get the best results from the architecture which the architect designs. The ruling style of architecture, the size of buildings, their general outlines, all have a direct relationship, not only to the beauty of the campus, but to the basic planning. But beyond that middle ground the landscape designer wrestles with every problem of major relationships within the campus boundary, and sometimes some problems such as connections with major streets and trafficways that reach beyond the edge of the campus.

Convenience, efficiency, low maintenance, low original cost, fullest adaptation of the site to use, are primary objectives in good planning. Beauty is inherent in the design where these objectives are reached. The planting of trees and shrubs adds drapes, color spots, other elements of softening beauty, relieving the severity of masses of architecture on an open plot, but the very essence of beauty is in that more fundamental use planning. No amount of horticultural adornment will fully hide the ugliness of a campus where the steam plant is in the wrong place, where the roads are indirect and excessive in amount, where the buildings are awkwardly spaced and queerly located with regard to the uses they are to serve. Trees, shrubs, vines, and flowers are the exquisite finishing touch where a good general plan is developed.

Campus planning is not simply a program of beautification. It is a drive toward orderly, coordinated development, based upon efficiency, and founded on sound analysis of problems involved and a plan for solving them.



Matters of First Importance in Initiating a School-Building Program

BY JOSEPH H. HIXSON

DIRECTOR, SCHOOL BUILDINGS AND GROUNDS DIVISION, THE STATE EDUCATION DEPARTMENT, ALBANY, N. Y.

FACED by a need for additional or improved school-building accommodations, what steps should a board of education and its administrative officers take to properly initiate the building program? The following suggestions will be helpful in approximating the answer to the question:

Survey the Existing Plant

First, make or secure the service of qualified persons or agencies, and have made a careful survey of the existing plant. Use a standardized school-building score card such as the "Score Card for High School Buildings" by Strayer and Engelhardt[1] or "The Butterworth School Building Score Card."[2] The anaylzed scores will show to what extent the existing plant is usable. A descriptive statement, setting forth in non-technical language the results obtained through scoring the buildings, enables the board of education and the people at large to understand what existing conditions are. Having carefully determined what existing plant conditions are, the board is ready for the second step in the program.

Determination of Type of Organization and Extent of Educational Program Desired

The second basic limiting factor in any school-building program is the determination of the type of organization and the extent of the educational program which the district desires to provide. How many years or grades of work are to be provided for within the district? Six years, seven years, eight years, nine years, ten years, eleven years, twelve years, fourteen years or sixteen years? Shall the type of organization be 8-4; K-8-4; K-6; K-6-3; K-6-3-3; K-6-6; K-6-4-2; K-6-4-2-2; K-6-4-4; or some other combination? Shall the district operate a junior high school, a senior high school, a junior college, or can these grades and years of work be better provided for through cooperation with some adjoining or neighboring school district? Is a redistricting either likely or desirable? If so, should this have first consideration?

Shall the course of study be narrow or broad? What technical courses, if any, shall be taught within the district? Which can better be provided for by contract with some other district? The extent of the educational program to be provided for is of the greatest importance and should receive in the early stages of the building program much more attention than it has heretofore received. It is not enough that only present needs be thought of in developing a building program. Buildings now under construction will help or hinder the educational program in the communities they serve for the next half-century or more. It is then of the greatest importance that they house or be a part of the extended building program which will house satisfactorily the necessary and desired educational program in their several communities.

District's Ability to Finance the Desired Program

Having determined the condition of the existing school plant and the type and extent of educational program to be desired, next the district's ability to finance the desired program should be determined. In doing so the actual wealth of the district, the assessed valuation and the school tax resources of the district must be considered. State aid, foreign tuition and other sources of school moneys must be studied. Comparisons should be made with other districts of like size, wealth, tax rates and other comparable characteristics. In determining a district's ability to finance a given program, careful and extended studies should be made of other districts that have been carrying such a program over a period of years. Concrete detailed factual data should be gathered and tabulated, in order that there may be no need for "guesses" or approximations as to what has been the experience in other districts. The program should be limited to the real needs of the district and the district's ability to pay without resulting in unreasonably high school taxes. School taxes are only one of the many tax burdens that rest upon the modern community.

The Building Program Itself

The fourth step is the formulation of the building program itself. The study thus far should reveal the ideal program for the district, the district's ability to pay for this ideal program or at least that part which represents immediate urgent needs, and the extent to which the existing plant can be used to advantage. The immediate problem is that of setting up the ideal building

[1] Strayer, G. D., and Engelhardt, N. L.: "Score Card for Elementary School Buildings"; "Score Card for High School Buildings"; "Score Card for Village or Rural School Buildings of Four Teachers or Less."—Bureau of Publications, Teachers College, Columbia University, New York.

[2] Butterworth, J. E.: "The Butterworth School Building Score Card."—World Book Co., Yonkers-on-Hudson, N. Y.

program to house the educational program to be offered.

What is to be done with the existing plant? How can it be used to advantage, if at all? How much additional building is needed immediately? What will be the school plant needs ten, twenty, forty, sixty years hence? If the building needs can be provided for through a construction program covering a period of years, what buildings can best be delayed?

A study of the school-building score cards will show which buildings are worth keeping or remodeling, and in what particulars; while the district survey showing population trends, pupil distribution and the district's probable future extension as limited by the plans adopted by the city or district planning commission, will indicate immediate and probable future school-building needs throughout the district.

Frequently, accomplishment of the ideal building program must be delayed for a period of years, because of existing plant limitations. It is seldom, indeed, that the ultimate plant cannot be made to approach the ideal, if a long-time program is definitely set up and carried through step by step over a period of years. Many a district has practically guaranteed an ideal future school plant by adopting a policy of requiring that all buildings be of the unit type, making it possible to meet either expected or unanticipated increased future needs by the addition of well-planned, ready and economical building units and by purchasing desired school sites years in advance of actual needs and by adopting a policy of watchful waiting to extend sites in use by ever being upon the alert to buy at favorable prices properties adjoining its small school sites.

The Educational Specifications of the Buildings

The determination of the educational specifications of the new construction is the next step in the program. The number of compartments, their size, shape and general arrangement, should be definitely determined by the educator. In making this determination, the board of education and its administrative officers will usually find it worth while to have the assistance of the school-building specialists in their State Department of Education, or those giving courses in school-building problems in the larger universities and colleges. The growing practice of retaining educational consultants is a most hopeful one. There is hope that in the near future boards of education will retain the services of educational consultants in school-building programming as uniformly as architects are now retained to plan the buildings and supervise their construction.

The use of some such score card or check list as that developed by F. W. Hart and published as "The Strayer, Engelhardt and Hart Schoolhousing Series"[3] is recommended. Through the use of such a check list of building compartments and related items, it is possible to reduce to a minimum the number of items to be added after the educational specifications of the building have been tentatively agreed upon. At this point it is also advisable to secure the assistance of the school-buildings specialists in the State Department of Education in developing the educational specifications. Through their everyday contacts with buildings throughout the state and their opportunity to know building trends, their help should prove of very great value. In any case, if the buildings must have the approval of the State Department of Education in the end, tentative approval should be secured as early as possible.

When the educational specifications have been definitely determined, agreed upon and written out, the board is ready to seek an architect to plan the needed building.

The Selection of an Architect

The selection of an architect is one of the most important steps in the initiation of the school-building program. For best results, the board of education should seek out, find and call in the architect it wants, just as any individual board member would do if he were in need of the professional services of a doctor or a lawyer. If a competition is desired, it should be conducted strictly in accordance with the rules and regulations prescribed by the American Institute of Architects for the holding of such competitions. Competitions are not recommended.

If a lawyer hounds prospective clients to sell his services to them, his action is characterized as "ambulance chasing," and he is rightfully condemned as unprofessional. But even in 1930 architects may set upon board members like vultures upon a carcass and the degrading practice is accepted among architects as an unfortunate but excusable practice. During the inspection of the ruins of a school building that had burned thirty-six hours before, I remarked to the president of the board of education: "I see you have had the misfortune to be visited by fire." He responded with an oath, "Yes, . . . by architects, too."

Recently an architect of national prominence in his profession complained that this "ambulance chasing" practice caused many architects of high standing to have little or no part in planning America's public schools. If this is true, —and it is,—is it not time for the architectural profession and the educators to discourage a practice that tends to submerge boards of education under the onrush of a flock of practitioners of mediocrity?

Getting, Keeping and Deserving the Confidence of the People

School-building programming is only a part of the continuous work of the board of education;

(*Concluded on page 25*)

[3] Hart, F. W.: "The Strayer, Engelhardt and Hart Schoolhousing Series."—C. F. Williams & Son, Inc., 36 Beaver St., Albany, N. Y.

New application blank developed by the School Buildings and Grounds Division of the State Department of New York for use of local school boards in making application for the Commissioner's approval of plans and specifications for proposed new school buildings

THE UNIVERSITY OF THE STATE OF NEW YORK
THE STATE EDUCATION DEPARTMENT
SCHOOL BUILDINGS AND GROUNDS DIVISION

APPLICATION TO
THE COMMISSIONER OF EDUCATION
FOR APPROVAL OF
BUILDING PLANS AND SPECIFICATIONS

(Pursuant to provisions of sections 451, 452 and 453 of the Education Law and Regents Rules and State Education Department Regulations)

SECTION I

Application is hereby made to the Commissioner of Education for the approval of the accompanying plans and specifications by...Registered Architect[1]...., on behalf of the[2]..., the regularly constituted authority of[3].. No................., town of.................................., county of ...., State of New York.

SECTION II

The plans and specifications are for a proposed[4]..

....

to be located upon the........................acre site owned by the school district on behalf of which this application is made.

SECTION III

In preparing these plans and specifications extreme care has been taken to guard against any necessity for changes or additions after they have been approved by the Commissioner of Education and after contracts have been let. The undersigned is familiar with the Laws of the State, the Rules of the Board of Regents of The University of the State of New York and the Regulations of the Commissioner of Education governing plans and specifications for the erection, repair, enlargement and remodeling of school buildings and accepts the responsibility for securing the award of contracts and the construction of the proposed building in strict compliance with said Laws and Rules and these plans and specifications as submitted and approved. Should there arise a need for change in plan or specification, amended application will be made to the Commissioner of Education and his approval secured before permitting, authorizing or directing such change.[5]

SECTION IV

These complete plans and specifications are based upon the preliminary studies,[6] copies of which were originally submitted to the Director of the School Buildings and Grounds Division of the State Education Department and the superintendent or district superintendent of schools on the.............day of the month of....................................., 19........ and they now include the changes, if any, recommended by the Director. The superintendent's certificate of recommendation accompanies this application.

145-Ja30-3000(7965)*

Sec.	Do not write in these blanks	
I	District	
II	School building	
III	Addenda	
IV	Preliminary	
V	Sewage system	
VI	Engineers	
VII	Cost estimate	
VIII	Bids received	
IX	Reported	
a IX	Inspected	
X	Application	
XI	Appropriation	
XII	Approval	

SECTION V

Is sewage disposal by authorized city or village system or by independent system to be constructed by the school district?[7] ....

SECTION VI

Engineering and Consultation Service Retained by the Architect[8]

Structural engineer .... Registration number..........

Heating engineer .... Registration number..........

Ventilating engineer .... Registration number..........

Sanitation engineer .... Registration number..........

Electrical engineer .... Registration number..........

SECTION VII

Architect's Estimate of Cost

	Enter each and every item in this column	Do not write in this column
General contract	....	....
Heating and ventilating..........	....	....
Sanitation, plumbing etc..........	....	....
Electrical contract	....	....
Architect's commission	....	....
Total estimated cost..........	....	....
Cubage of building..........	....	....
Estimated cost per cubic foot..........	....	....
Appropriation available	....	....
Class of building: A, B, C, D[9]..........	....	....

SECTION VIII

Immediately after contracts are let a completely tabulated copy of all bids received together with name and business address of contractors with whom contracts are signed and their subcontractors, if any, will be forwarded to the School Buildings and Grounds Division to complete this application.

SECTION IX

When and as soon as the building is completed notice that all contractors have their work in readiness for final inspection by a representative of the School Buildings and Grounds Division of the State Education Department will be given and when the time of final inspection has been set by the Director of said Division all contractors will be notified by the undersigned architect to be in attendance during the inspection.

SECTION X

This application is made in keeping with a contract for architectural services entered into between the undersigned and the constituted authority in the above-named district on the......................day of the month of......................................, 19........

[*Signed*] ...., *Architect*

Registration number and seal..

Mail address ....

Dated this................day of the month of..., 19........

SECTION XI

The accompanying plans and specifications were examined and formally approved by the[2]

...., the regularly constituted authority of[3]..., No............, town of..., county of.., State of New York, on the...................day of the month of ...., 19........

There has been appropriated for this proposed project a total sum of not to exceed ....dollars. The money to be taken from[10]...

....

[*Signed*]...

President, Clerk or Sole Trustee

Title..

My term of office expires on the.............day of the month of.., 19........

Dated this.............day of the month of ...., 19........

SECTION XII

I, ..., Director of the School Buildings and Grounds Division of the State Education Department have examined with great care the accompanying plans and specifications and do hereby declare that they have been found to be reasonably in keeping with the needs of the district and in strict compliance with the Laws of this State, the Rules of the Board of Regents of The University of the State of New York and the Regulations of the Commissioner of Education.

Signed and dated this...............day of the month of..., 19........

....

Director

[1] The presentation of plans shall be in strict compliance with limitations imposed by article 56 of the Education Law. The application, each separate sheet of plans and each set of specifications shall contain the architect's name, registration number and seal.

[2] "Board of education"
"Board of trustees"
"Sole trustee"

[3] "Union free school district"
"Central rural school district"
"Central high school district"
"Common school district"
"..............................City school district"

[4] "New high school building"; "new high school building and its equipment"; "new grade and high school building and its equipment"; "addition to and remodeling of Roosevelt grade building"; "new heating and ventilating system in Harding Avenue grade building" etc. Use extreme care and state exactly what is proposed to be done. The language used here must be substantially and should be exactly that used in the appropriation and bond resolutions.

[5] Regulations of the Commissioner of Education, section 1: Plans and specifications for the erection, repair, enlargement or remodeling of a schoolhouse, required to be submitted to the Commissioner of Education for his approval as provided in section 451 of the Education Law, shall be submitted in duplicate. When approved, one set shall be placed on file in the Education Department and the other returned to the trustee or board of education submitting such plans and specifications, with the approval of the Commissioner of Education indorsed thereon. *Alterations or addenda to plans and specifications so approved shall also be submitted to the Commissioner of Education in like manner and be approved by him before they become effective.*

[6] Two copies of the architect's preliminary studies and later amended studies, if any, shall be sent by the architect to the Director of the School Buildings and Grounds Division, State Education Department, as soon as they are available. One copy shall be filed in the School Buildings and Grounds Division and the other shall be returned to the architect by the Director of the Division together with his recommendations. So far as possible, all preliminary studies and completed plans and specifications received on or before Friday of a given week will be reviewed, acted upon and returned to the architect on the following Monday or Tuesday. This lapse of time is necessary in order that the specialists in the several divisions of the Department and the superintendent or district superintendent of schools shall have an opportunity to view the plans and place before the Director of the School Buildings and Grounds Division any criticism, comment or recommendation affecting them.

One copy of all preliminary studies and completed plans and specifications shall be mailed to or placed in the hands of the superintendent or district superintendent of schools at the same time that they are mailed to the Director of the School Buildings and Grounds Division of the State Education Department. These shall become a part of the official files of the school district or supervisory district, as the case may be.

[7] In the case of an independent system this application must be accompanied by a certified copy of letter of approval of proposed disposal system by the State Department of Health. Application for approval of sewage system should be addressed to the New York State Department of Health, Division of Sanitation, Albany, N. Y.

[8] Both plans and specifications shall contain the names and registration numbers of engineers who have prepared them. All engineering shall be done in keeping with and under the limitations imposed by article 55 of the Education Law.

[9] **Classification of Buildings as to Fire Hazard**

Class A Buildings constructed entirely of fireproof materials with the exception of windows, doors, standing trim and finish flooring of classrooms for which wood may be used. Stairs and floor surfacing in rooms other than above to be of fireproof material.

Class B Buildings having exterior and interior walls, stairways and the entire first floor construction of fireproof material, but with wood floor and partition construction elsewhere, wood roof construction, and wood for windows, doors, standing trim and finish floors.

Class C Buildings having exterior masonry walls throughout and interior masonry walls in basement, and fireproof construction around fuel and heater rooms, but otherwise of wood construction with fire stops in all partitions.

Class D Buildings having masonry basement and foundation walls but otherwise of frame construction. with firestops in stud walls and partitions, and the heater and fuel rooms inclosed with fire-resisting materials.

(A plus, A minus, B plus, B minus may be used to denote further discrimination in classification.)

[10] "Funds on hand"; "funds raised by the issuance of bonds"; "bond issue of $100,000 and $50,000 received from insurance on the old building." State definitely the source of moneys to be used.

(Continued from page 21)

but it is an important part. To get, keep and deserve the confidence of the people, it is necessary to keep them informed upon the educational needs of the district and the board's program of meeting these needs.

The dissemination of knowledge having to do with school-building needs should be made to fit into the board's publicity program as a chapter or a series of chapters in a well-written book. Where the board has developed a publicity program to keep the public informed, it is more than likely that the public will have known of the building needs for the most part, and the further steps will require only that the board's program of meeting the needs be made known and popularized. Where there has been no continuous publicity program, it will next be necessary to place the need and the program before the electors in such detail and in such form as to secure a popular understanding of them and in the end the approval of the recommended program, for, as too often happens where nothing is done to inform the public of the need until the time has arrived when something must be done to meet it, some compromise, substitute program must be accepted by the board, to the lasting detriment of the district's educational program.

Once a building program has been referred to the people for their consideration and has received their endorsement, this program should not be changed in any way that will violate the confidence of the people. Should unforeseen contingencies compel a change in program, the new program should be referred to the electors and have their support before it is undertaken. In most cases where boards of education do not have the confidence of the electors, there is a reason, and the confidence is not, or at least has not been, fully merited. The need for a new building is never urgent enough to warrant a violation of, or infringement upon, the confidence of the people.

Are Large or Small Units of School Administration Preferable?

BY WILLARD S. FORD, PH. D.

PROFESSOR OF EDUCATION, UNIVERSITY OF SOUTHERN CALIFORNIA

The Organization of School Administration in the United States

THE schools of the United States serve approximately 25,000,000 students, employ a staff of approximately 1,000,000 teachers, and involve an annual expenditure in the neighborhood of $3,000,000,000. Judging from present American business methods, one would expect such a huge organization to be organized under a central control, with the administrative head in the national capital. This is not the case, however. While the Federal Government has a number of bureaus primarily interested in education, the major responsibility is left to the states. Each of the 48 states has an educational administrative organization. The states, without exception, delegate a major part of the responsibility to local school units. These units are in some cases districts, in others townships, and in still others county units.

The large number of these districts is illustrated by the situation in California. In 1926 there were in that state 3,260 elementary school districts, 289 high school districts, and 12 junior college districts, a total of 3,561 more or less independent school units. Each of these districts has a lay board of at least three members and a professional administrative head. There are no less than 11,000 lay board members responsible for a part of the educational system of the state of California. The situation is more significant in view of the fact that 1,555 of the elementary districts, which is nearly 50 per cent of the total, serve only 20 pupils or less. Educational administration in the United States is certainly decentralized.

Decentralization Due to Method of Development

Decentralization of the school system was not planned. It developed with the westward expansion of our civilization from the Atlantic to the Pacific. The control went to the states by default when the Federal Constitution failed to make provision for it. The states granted control to the local communities whenever these were able to establish schools. The responsibility of providing educational opportunity became a local function under the supervision of the state.

Criterion for Evaluation

Before we can determine whether or not we should retain the present decentralization, it is necessary to set up criteria by which to measure its efficiency and determine the advisability of modification. The criterion by means of which we should make this choice is the efficiency of the present school organization. This efficiency may be measured by a number of qualities, of which the following are important:

1. The educational attainment of the pupils
2. The extent and quality of the educational program
3. The type and quality of the school buildings provided
4. The quality of the administrative leadership
5. The cost of providing the present education

The Educational Program and Pupil Achievement

Inasmuch as we are unable to anticipate what conditions might obtain under a highly centralized system, our nearest approach to an evaluation is to compare the present results in large and small units of educational administration. The limitation of numbers makes it impossible for small school units to provide the same quality of educational program which the larger units provide. The one-room country school with its eight grades has a very meager offering compared to the offering in the elementary and junior high schools of the city organization. Such evidence as we have available of the achievement of students as measured by standardized tests, also indicates that even on the formal subjects the students in larger school units do better on the average than those in the small rural schools. It is quite generally accepted that a concentration of pupils makes possible a more desirable educational program.

Buildings Provided

Decided progress has been made in the improvement of the rural school buildings, and the little red schoolhouse has in many places been replaced by modern classroom units. Nevertheless, rural schools are still unable to furnish the special facilities which are generally provided in the city schools. Auditorium, gymnasium, library, cafeteria, medical suite and health units are important building provisions which cannot be furnished in the small district.

Quality of the Educational Leadership

The stupidity and the arrogance of board members in small districts is so frequent as to cause one almost to doubt the desirability of lay board

control of the educational process. With little educational background and no educational vision, they evercise an autocratic control over the teacher who keeps their school. The professional staff, though they may have the training, background, and ability to exercise educational leadership, have little opportunity to do so under these conditions. An increase in the size of the unit tends to increase the amount of work to be done in the administration of schools to the degree where the lay board is willing to turn the responsibility over to a professional executive head. Eleven thousand laymen directing the educational activities in a great state could hardly be expected to be efficient.

The Cost of Education

The element of greatest concern, although possibly not of greatest importance, in determining the desirable school units is the cost of providing educational opportunities for the children of the state. There are many factors which influence cost. Size is but one of these factors, although an important one.

An analysis of the cost per pupil for providing a particular level of education in any state makes it apparent that the wealth of the community is a large factor in determining the expenditures for education. Quite naturally, the poorer communities have a meager offering, and the wealthy communities a more elaborate one.

Density of population is also an important factor in cost. In a thickly settled district it is a simple matter to bring together enough pupils to provide education at a low cost, but in a sparsely settled community, even though the small one-room school were replaced with a central plant serving a comparatively large number of pupils, the cost of transporting those pupils from their homes to the school would tend to equalize the cost and make it high in spite of centralization.

Two examples of union high schools in California will illustrate this fact. The average cost per pupil in average daily attendance in schools of 700 to 800 pupils in California for the school year 1928-29 was $219.10. Taft High School, with an enrolment of 799, has a very extensive transportation system. The cost for this school was $320, the highest of the ten, and $100 higher than the average for schools of that size. Antelope Valley probably has the most extensive transportation system in the country. The per pupil cost was $353. The average cost for current expenses per pupil in average daily attendance in schools of comparable size, 300 to 400 enrolment, in 1928-29, was $218.73. Transportation was responsible for a per pupil cost which was 60 per cent more than the average cost for schools of that size and only $44 less than the average per pupil cost of the small schools of less than 50 students, in average daily attendance.

The distribution of cost per pupil in average daily attendance in the California high schools

TABLE I

DISTRIBUTION OF HIGH SCHOOLS OF CALIFORNIA WITH A. D. A. LESS THAN 900, ACCORDING TO THE COSTS FOR CURRENT EXPENSES PER PUPIL IN AVERAGE DAILY ATTENDANCE, 1928–29 *

Current Expenses	Average Daily Attendance per School										
Per A. D. A.	1 49	50 99	100 149	150 199	200 299	300 399	400 499	500 599	600 699	700 799	800 899
$650–$689	1										
610– 649	0										
570– 609	1										
530– 569	1										
490– 529	1										
450– 489	1		1								
410– 449	4	1	0	1							
370– 409	3	2	6	0							
330– 369	4	5	8	5	2	1					
290– 329	0	13	3	1	5	0				1	
250– 289	2	9	15	4	7	1	2	3	2	1	
210– 249	1	7	14	12	10	14	7	7	2	4	2
170– 209	1	1	1	4	15	9	7	4	2	4	1
130– 169				1	1	1	1				2
90– 129					1						
Number of Schools	20	38	48	28	41	26	17	14	6	10	5

* Raw data secured from the Educational Commission of the California Taxpayers Association.

with an average daily attendance of less than 900, is presented in Table I. There is an evident relationship between size of school and the cost per pupil for current expenses. The decrease in cost with increase in size is most marked until we reach schools of 300 or more average daily attendance. The highest cost of the schools included in this table was in the Capistrano High School District, which has an average daily attendance of 30 pupils and a per pupil cost of $683. The wide range of costs in the lower enrolment groups indicates that factors other than size are important in determining the expenditures in those districts. The quality of the educational program, the wealth of the local community, the amount of transportation required, are probably the most important of these factors.

TABLE II

COMPARISONS OF THE AVERAGE AND VARIABILITY OF THE COSTS FOR CURRENT EXPENSES PER PUPIL IN AVERAGE DAILY ATTENDANCE IN CALIFORNIA HIGH SCHOOLS ACCORDING TO SIZE OF SCHOOLS, 1928–1929

Size of School	Number of Schools	Average Cost	Average of Middle 80%	Range of Costs	Standard Deviation
1– 49	20	$397	$391	$173–$683	$116
50– 99	38	295	292	182– 432	50
100–149	48	285	280	173– 460	64
150–199	28	277	279	150– 418	64
200–299*	41	232	230	93– 356	60
300–399	26	219	218	150– 353	37
400–499	17	213	213	159– 257	31
500–599	14	223	223	172– 275	32
600–699	6	237		199– 268	25
700–799	10	219	212	170– 320	41
800–899	5	195		159– 247	33

* The size of the interval was increased from 50 to 100 because of the decreased change and the smaller number of cases.

The relation of the size of the school to the cost per pupil is more evident in the materials presented in Tables II and III. When the average size increases from 25 students to 75 students, the average cost decreases from $397 to $295, a

TABLE III

COMPARISON OF AVERAGE COSTS PER PUPIL IN A. D. A. AND DECREASES IN AVERAGES FOR CALIFORNIA HIGH SCHOOLS FOR 1928–1929

Size of School A. D. A.	Average Cost	Decrease	Decrease from Highest Average
1– 49	$397	....	....
50– 99	295	$102	$102
100–149	285	10	112
150–199	277	8	120
200–299	232	45	165
300–399	219	13	178
400–499	213	6	184
500–599	223	— 10	174
600–699	237	— 14	160
700–799	219	18	178
800–899	195	24	202

difference of $102, which is approximately 30 per cent. As the size increases from that point on, the decrease is less marked. There is a slight increase in average cost when schools reach the size of 500 or 600, which may be due to the additional administrative staff which is usually provided for these schools. This, however, is again reduced as the size of the school reaches 700, 800 and 900. The per pupil cost in schools averaging 25 is more than twice as great in schools averaging 850 pupils. The most important saving in cost is made when the size is increased from 25 to 75 pupils.

A statistical analysis of the difference in cost indicates that the difference between schools of 25 and 75 pupils is a significant difference, with a critical ratio of 3.7. The difference between the smallest group and each of the larger groups is correspondingly significant. There can be no doubt from these facts that, were it possible to maintain only high schools with an averaging daily attendance of 100 or more, the total cost of providing the education would be less.

Differences of cost according to size in the elementary schools are as important as those in the high schools. Table IV presents the comparison

TABLE IV

SHOWING PER PUPIL COSTS IN ELEMENTARY SCHOOLS IN CALIFORNIA IN RELATION TO AVERAGE DAILY ATTENDANCE (1923–1924)*

Average Daily Attendance	Number of Schools	Per Pupil Cost Teacher's Salary	Per Pupil Cost for Total Operating Expenses
1– 10	730	$169	$205
11– 20	703	90	117
21– 30	293	62	83
61– 70	76	55	80
191– 210	20	53	74
751–1000	2	46	56

* F. W. Hart and L. H. Peterson: "The School District System of California." *The Tax Digest*, August, 1928.

of costs according to size of school in the elementary schools of California. The variation in cost is even greater than in the case in high schools. The average cost per pupil in the 730 schools whose average daily attendance was 10 or less was $205. This was nearly three times the average cost of the 20 schools whose A. D. A. was from 191 to 210.

Limits to the Size of Administrative Units

Administrative units may very likely become too large as well as being too small. There is little financial change in the elementary schools after the average daily attendance reaches 30. Likewise, the decrease in per pupil cost in the high schools is not significant after an enrolment of 300 is reached. The educational advantages, however, are undoubtedly extended much beyond these limits. The small high school cannot furnish the variety of courses or subjects or the extensive equipment and building facilities which are justified in the larger school unit. The educational offerings of the small elementary school are likewise meager compared to the variety of offerings and administrative modifications which make possible a recognition of individual differences in the larger schools.

The size both of the district and of the individual school may become too large. In the large school the close personal relationship of teacher and pupil becomes increasingly difficult. In the large district the school administration is likely to lose touch with the activities and the needs of the individual school. When personality is lost in numbers, the educational process is very likely to suffer. No one has yet determined scientifically how large the school may be and remain efficient or how large a district may become and continue to operate effectively.

Factors Which Resist Change

Regardless of how clearly the leaders of democracy see the need for change and modification in procedures, such changes are always laboriously slow. The movement toward larger administrative school units is no exception to this general rule. Observation of the conditions in the state of California, where there is an organized active effort to attain larger units of school administration, indicates that the most important of the factors which resist this change are as follows:

1. *Local Pride.*—Each local community feels that it must have control of its own schools, and must have a high school within its limits. Much of this local pride may be traced to the people of the community who will personally profit by retention of local control. The real estate subdividers are always ready to promote a new school in the vicinity of their plot.

2. *The Resistance of Present Administrators.*—Any one who is likely to lose his position in the event of a reorganization usually feels that the present plan is much superior to the new one. It would indeed be a modern miracle if the 48 state departments of education should unanimously request the Federal Government to take over the responsibility of education for citizenship.

3. *The Legal Obstacles.*—In many states the legal machinery offers a difficult barrier to reorganization. In some cases the school units are matters of the constitutional provision. There is always difficulty in securing satisfactory legislation.

4. *Natural Geographic Barriers.*—In many states there are sparsely settled communities which are separated by wide distances, mountain ranges, rivers, or deserts which make it impossible for a unification of control. In these cases it is necessary to choose between the provision of education in small units or the maintenance of the children at the centralized school site. Some districts are now experimenting with the desirability of furnishing dormitories for students to live in who come from great distances.

Larger Units of Administration Preferable

A study of the facts regarding the educational opportunities offered in large and small administrative units is sufficient to convince one—if primarily interested in the realization of democracy by providing equal educational opportunity to the youth of this country—that the small units are undesirable. Larger units provide better-trained and better-qualified educational leadership. Larger units make possible the enrichment of the educational program without excessive cost. Larger units provide better housing facilities, modern equipment and a higher standard of educational environment. Finally, elimination of the small districts tends to reduce the cost of providing this more adequate type of educational opportunity. These facts are the common experience in educational administration.

Score Card for Selection of School Sites

BY N. L. ENGELHARDT, Professor of Education

AND

W. B. FEATHERSTONE, Graduate Student in Educational Administration
Teachers College, Columbia University

THE selection of suitable sites is an element of the school plant program that is too frequently neglected. In many cases sites are selected only after the most desirable locations are largely occupied for other purposes, or after the need for new school buildings has become pressing. Such procrastination generally results in sites that are excessively costly if at all adequate.

More frequently, however, in the interest of lower initial cost, sites are obtained which are inadequate in area, improperly located with respect to the population to be served and with respect to other types of building in the locality, inaccessible from available or easily developed travel and transportation facilities, and unsatisfactory in shape, topography and orientation. Consequently, the actual construction of buildings is conditioned largely by site limitations. Desirable elements of planning and construction must be sacrificed in order to adapt buildings to unsatisfactory shape or surface features or to avoid encroaching so much on the limited area as to destroy its utility for playground purposes or greatly limit the possibilities of proper landscaping. It is frequently necessary to provide more than the optimum number of stories, to make use of basement rooms, to resort to play courts on roofs, or to handicap the proper lighting of the building by reducing the area of courts and light wells and by orienting the building in violation of accepted standards.

It cannot be too strongly emphasized that the site program should move well in advance of the actual building program. As soon as a city shows signs of development in any particular locality, the school authorities should be alert to see that adequate sites are selected in proper locations before the land is occupied for other purposes or by other types of construction. The selection of sites may precede actual erection of buildings by several years, but it is always preferable to be prepared well in advance of actual building needs in order to avoid the delay which inevitably accompanies the acquisition and clearing of sites that have been devoted to other purposes, and in order to avoid excessive costs due to rise in property values.

It may happen that the most careful and conservative predictions of the future development in a community will be inaccurate. Sites that have been acquired may not be needed. It usually proves easier, however, to dispose advantageously of sites not needed for school purposes than to acquire them after building needs have become urgent. Whenever there is reasonable doubt as to the future development of a community, the school authorities should act on the side of safety and acquire sites which will be adequate for any needs which may seem reasonably likely to develop.

The score card for use in the selection of school sites has been developed for the purpose of assisting boards of education in evaluating areas which may be available for school sites, or the purchase of which the board may be considering. It should also be useful in evaluating sites they have already acquired, with a view to determining the use to which they can most advantageously be put. Thus, it provides a check on the entire site program. Its use should serve, also, to point out forcibly the limitations of present sites or possible desirable uses to which they may be put, if building expansions or alterations are being contemplated. Its most significant value may lie in the emphasis it serves to place on the site as a major part of the entire plant program.

ENGELHARDT SCORE CARD TO BE USED IN THE SELECTION OF SCHOOL BUILDING SITES *

Location of site under consideration..

ITEM	DESCRIPTION	1		2
I. LOCATION AND ACCESSIBILITY				250
A. Scientifically located as to present and future population	Objective technique used to measure population in all aspects contributing to a best choice. Should be made on basis of most objective and scientific measures of population trends, building development, industrialization, neighborhood and community planning and the character of educational program that will be required.	50		
B. Maximum travel distance	High school—2 miles; junior high school—1 mile; elementary school—½-mile. There should be a minimum of overlapping of areas to be served within the optimum radius for any type of school, but consideration must be given to natural and artificial barriers, travel facilities and character of population in determining areas to be served and distances to be traveled.	50		
C. Accessibility to general public	The site should be readily accessible to all who are to be served by this school. As far as possible, sites should be accessible from every direction and from all parts of the area to be served. Attention should be given to special services which may be provided and which may extend beyond the limits of the area normally tributary to the school.	30		
D. Remoteness from business	Freedom from business distractions should be sought. Attention should be given, not only to present conditions, but also to future possibilities as indicated by character of the community and city zoning regulations.	30		
E. Remoteness from industry	Sites should be free from noise, odor, dust and traffic of industry. Consideration should be given, however, to availability of industrial plants which may cooperate in part-time vocational programs which may be developed.	30		
F. Remoteness from hazards	Freedom from all immediate water, air or land travel hazards. Sites should not be located near railroads, landing fields, docks or main traveled highways unless adequate protection is possible. Even where protection is possible, attention should be given to the factor of noise and distraction. Attention should also be given to fire hazards and other possible sources of danger to life or health.	30		
G. General character of neighborhood	General locality should offer only the most favorable social influences. Careful attention should be given to the remoteness of nuisances of every kind, and of all possible sources of improper moral influences. Sites should not be located where there is possibility of stirring up strife among different elements in the population to be served. Preference should be given to sites located near the center of racial or nationality groups rather than on borders between such groups.	20		
H. Proximity of service facilities	Access to water, sewers, electric light and power, gas and telephone should be readily possible.	10		
II. SIZE	High school—20 or more acres; junior high school—10 or more acres; elementary school—5 or more acres. These areas should be considered the minimum that is acceptable. In selecting sites well in advance of possible building construction, care should be exercised to see that areas are adequate to provide for any program that may reasonably be expected to develop in the future. Sites should vary in size with the probable enrolment; 100 square feet per pupil is the minimum that should be provided; 200 square feet is more nearly optimum.			300

* Published in outline by the Bureau of Publications, Teachers College, Columbia University, 1929. Comments added by authors of articles.

III. TOPOGRAPHY				250	
A. Elevation	Suitable for proper drainage throughout at reasonable cost. Should be free from drainage from contiguous territory. In localities where winters are severe, attention should be given to features of the site advantageous for protection from the weather. In warm climates sites should be located to take advantage of prevailing air currents. Sites should not be selected in localities where there is a tendency for smoke and fog to settle or where natural or artificial barriers tend to produce undesirable air movements.	50			
B. Orientation	The preferred orientation of each type of room should be possible. Desirable relationship of buildings to one another and to play fields and service units should be attainable. In cold and northern climates it should be possible to locate buildings so as to provide for maximum sunlight on all parts of the building without interfering with the proper arrangement of grounds.	40			
C. Shape	The shape should be approximately rectangular, in order to eliminate unusable space, but with length not too great for width. "Shoe-string" sites should be avoided, as well as odd-shaped or very irregular plots.	40			
D. Vista	Maximum capitalization of the esthetic, both from a distance and at close range, should be sought. It should be possible so to locate a building on the site that it can be viewed as a unit and in proper esthetic relationship to other features of the site.	30			
E. Surface of land	A portion of the area should be available, at a reasonable preparation cost, for athletic fields and playgrounds. A portion of site sufficient for commanding location of building is essential. Extreme gradients should be avoided and contours should be be fairly uniform over the entire surface.	50			
F. Distribution of natural elements	Position of soil, rocks, water and sand should be such as to insure ease in putting in foundations and making athletic fields and playgrounds. Natural ground is to be preferred to artificially constructed land. Soil should be non-alkaline, non-erosive, and of suitable character and fertility for landscaping and gardening.	40			
IV. UTILIZATION AND COST				200	
A. Present utilization	Site should be free from expensive structure with minimum salvage value. Sites built up with brick or masonry buildings should be avoided unless such buildings are obsolete or of very poor type.	25			
B. Possible future utilization	Possible future value if not needed for school purposes should be anticipated so that a minimum of future tax revenue is lost.	50			
C. Original cost	Cost should be reasonably consistent with the character of the community. Preference should be given to a site that can be obtained at reasonable cost by ordinary processes of appraisal and evaluation over one that must be obtained through condemnation proceedings.	100			
D. Other costs	Cost of new improvements, such as streets, sidewalks, sewers and water extensions, should be considered. This involves consideration of location with respect to present developments and of character of land, topography and elevation.	25			
	MAXIMUM POSSIBLE SCORE	1,000		1,000	

Use the second half of column 1 for the scores on the literal subdivisions when a specific site is being rated. The second half of column 2 permits of the summation of these scores.

Section II

DESIGN AND CONSTRUCTION OF BUILDINGS

Selecting an Architect

BY WILLIAM ORR LUDLOW

LUDLOW & PEABODY, ARCHITECTS, NEW YORK

WHAT is the best way to select an architect? This is an important question to a large number of men and women who have to do with the erection of the several thousand school and college buildings that are built every year in this country. Of course, there is no formula to solve this problem, but there are distinctly right and wrong ways to go about it.

First, I should like to lay the ghost of an old bogey which is still supposed by some to be alive, although it actually died at the hands of the public some years ago. I refer to that pernicious thing with the fair-sounding name of "Competition," which meant a mad scramble of otherwise respectable architects to obtain the job by submitting plans and a pretty picture which supposedly showed their professional ability. Of course it did no such thing, for it is a far cry from the draftsman's ability to produce good-looking paper pictures to the ability to produce a building economical in plan and materials, suitable in the necessary complicated equipment of heating, lighting, ventilating; a building serving the purpose of education with its modern technique, and withal a building that will be good to look at and a civic improvement that wins the commendation of those who pay for it.

Competition of that sort meant thousands of dollars wasted by the architectural profession, much trouble and confusion of mind to building committees, and, often as not, a bad choice because based on a paper presentation of ideas about a building rather than proved ability to produce a building.

How to Begin

The right way to select an architect is very much the same as the method by which the doctor and the lawyer are selected—on the basis of reputation and past performance.

The first step in this direction is to compile a list of the available architects. The names of men who have successfully planned school and college buildings can be obtained from the publishers of The American School and University,* and of the School Board Journal, and from the officers of schools and colleges.

Select from these the names of those whose home offices are not too remote, or, if remote, who have ability to carry on work at a distance. Obtain from each of these a list of their executed work with photographs, and a letter telling of their experience and special adaptability for the particular work in contemplation.

It is then usually possible to pick out four or five of those most eminently fitted for the work proposed, and get further information as to the relative fitness of these, keeping in mind that favoritism and friendship must be eliminated as factors, also that the architect who has done the most work or the most conspicuous work is not necessarily the best architect for the particular work proposed.

Questions

Let me suggest some of the important questions that determine the suitability of an architect:

1. How long has he been in independent professional practice?
2. What kind of an organization has he?
3. How much work has he done of the general type under consideration?
4. What do his clients say about him?
5. What do other architects say about him?
6. Have his buildings been planned with economy of space and materials?
7. Do his buildings show artistic ability?
8. Will he give personal attention and whole-hearted interest to your particular job?
9. Is he a man of high character?

To answer these questions it is advisable to visit the selected few at their offices, but if this is not feasible, they may be invited to meet the committee. Such interviews should be so arranged that the architects are invited at different times, for there is nothing more humiliating to the architects, or more embarrassing to the committee,

* In Section XIII of the present volume will be found a list, classified by states, of more than 1,000 architects for school and college buildings. This list is restricted to architects who, during the last five years, have designed three or more educational buildings costing $50,000 or more each. The listing for each architect is restricted to three buildings which, in his opinion, are typical of his best work in the educational field.

than for the architects to be put in the position of a group of competing salesmen.

Fees

In considering relative merits, the matter of fees, at least cut-rate fees, should not enter into the consideration; for a difference of 1 per cent, for example, may represent to the school board a difference of ability that may waste many times this amount in the actual cost of the building, to say nothing of the effect on its suitability and quality. The Schedule of Minimum Charges of the American Institute of Architects gives as a proper minimum fee 6 per cent, plus the cost of an engineer's services for the mechanical equipment. No architect of experience and with proper office organization can possibly afford to work for less than this. It should be remarked also that the American Institute of Architects strictly admonishes its members that it is unprofessional and unethical for architects to compete on the basis of fees.

Another vexing question that often arises is the wisdom of employing local architects because of diplomacy or because of such men's knowing local conditions, and being readily accessible. Diplomacy, local pride, keeping the architect's small fee "in town," are wholly outside the obligation that a school board owes its community, in providing the best services that can be obtained; but if architects of experience and ability are local men, the advantages of being "on the ground" and having particular interest in home work should have due weight.

Question No. 9, "Is he a man of high character?", is of great importance. I am not referring to "good character." Of course he must be honest, but I have in mind the kind of services that money will not buy—that something that means that he will go "the second mile" with you—that means that he will put into your work that something which we call character, for a building has character just as surely as its creator.

Having selected your architect, give him your confidence, tell him frankly just how much money you have to spend, and help him in every way to produce for you the very best, and this can only be obtained by the friendly relationship and cooperation of school board and architect.

What Shall We Tell the Architect?

BY MURRAY A. DALMAN

EDUCATIONAL CONSULTANT, PERKINS, CHATTEN & HAMMOND, ARCHITECTS, CHICAGO, ILL.

MUCH has been said about greater cooperation between school authorities and architects. Both are convinced that this is necessary if there is to be improvement in school housing conditions. Both have been earnestly trying to solve the problem of housing schools in buildings which would fit as nearly as possible the educational program, but they have talked different languages; that is, they interpreted statements in different ways. The teacher gave the architect credit for too much knowledge of school matters, and the architect gave the school man credit for too much knowledge of building matters. Their interests in the buildings are along entirely different lines, the school man's interest being primarily in the use of the building, and the architect's interest, the building itself.

Many Small Problems to Be Solved

The problem of school housing is a complicated one and in its solution must be reduced to its component parts, which are relatively simple. By this reduction, a long series of small problems is presented. This article is intended to suggest some of these small problems which must be answered in terms of local differentiation from general standards to fit the specific needs of the community and its educational program.

Many school administrators spend their lives trying to fit schools to buildings. That is true of new as well as old buildings. In large cities where a building program is a continuing affair, many of the component problems have been solved, but in places where buildings are four or five or ten years apart, misfit buildings are just as prevalent as ever.

The chief cause of this difficulty is a lack of a definitely stated educational program and the lack of a definite statement of building needs and requirements for the architect who is chosen to plan the school building. These requirements should be carefully worked out by the school authorities, reduced to drawings in many instances, and discussed with the architect before he begins his preliminary plans. The requirements should cover not only the matter of orientation, placement on site, landscaping, and playgrounds, but, above all, the intimate interior. If the architect chosen is a school specialist, he can very often make valuable suggestions concerning the solution of problems, but he will welcome the definite statement of needs and requirements.

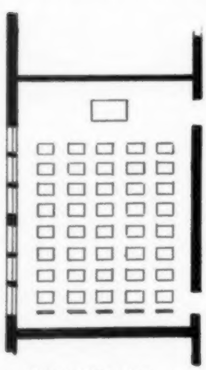
It is not intended that all the questions suggested in this article should be determined without discussion with the architect, but these and many more which have not been mentioned should be brought up for discussion and decision.

A school building consists of so many cubic feet, divided up into rooms and corridors to serve

many activities. An excessive allowance for one activity tends to reduce the allowance for another, since the answer must balance the money available, and this is never sufficient to satisfy all demands, and sometimes insufficient to provide the real needs.

What Are the Activities to Be Provided For?

The beginning of the statement of needs is a survey of all the activities demanded by the local educational program. This should be carefully made and reduced to areas and dimensions, not by opinion, but verified by tape and rule, and sometimes marked off on the floor for experimentation.



DRAWING NO. 1
Typical classroom, 22 x 32 feet. Forty No. 2 desks

It will be advantageous for the superintendent and his staff to visit buildings near by and to study plans of those at a greater distance, and perhaps consult research agencies which have made a study of similar problems.

There is one danger in visiting other buildings and studying plans. Rooms and buildings are very often planned to suit definite local needs and will not fit into another type of organization of facilities, but a study of other buildings will give a more comprehensive knowledge of possibilities on which to base a statement of requirements.

The first statement should be made up under two heads, "desired" and "required," so that in the later balancing and revision, opportunity will be given to match the requirements to the possibilities.

When this statement or "budget" has been made up, revised, balanced and checked, the school authorities will be able to say to the architect: "We need the following rooms, organized in this way. Certain changes of dimensions and sizes are possible, and rearrangements in organization may be made, but these changes and rearrangements must be formally approved in detail before they are incorporated in the final preliminary plans." When this part of the work is done, there are several hundred other problems dealing with the details of the interior which must be solved either by the architect or by the school man. Those that affect the use of the rooms should be solved by the school man.

The following discussion will serve to suggest the type of problem to be solved.

The Required Classroom Facilities

The unit common to nearly all school buildings is the class or home room. Classrooms vary in use, in capacity, and in equipment. These factors which are a part of the educational program must be worked out in advance. The requirements of the classroom will govern in the main the details of the rest of the building.

The number of children to be accommodated determines the size in a general way, but it is also dependent upon the activities to be housed. This in turn is determined by other factors, such as workrooms, libraries, and music rooms. If the classroom is to house several activities peculiar to its group of children, space must be provided for them. The following drawings are made from arbitrary dimensions, and illustrate but one solution. Certain equipment has been shown located arbitrarily.

Drawing No. 1 shows a classroom 32 x 22 feet with a layout for 40 pupils using No. 1 or No. 2 desks. The outside aisle is 36 inches, the inner aisle, 30 inches, and the aisles between desks, 18 inches. The back seat is 2 feet from the back wall, and the front desk is 7 feet from the front wall.

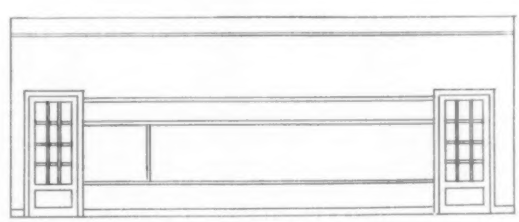
This room provides 16½ square feet and, with a ceiling height of 12 feet, 198 cubic feet per pupil.

Two doors into the corridor are shown. These doors are placed 18 inches from the end walls in order to provide as great a blackboard area as possible.

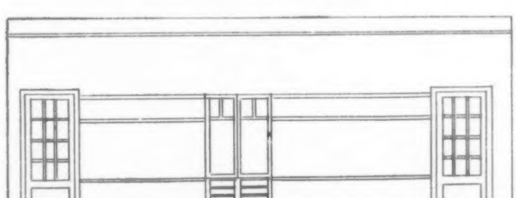
The front window is 5 feet from the front wall.

Drawing No. 2 shows the corridor wall corresponding to the floor plan. The picture mold is dropped 18 inches from the ceiling to allow the lighter ceiling color to be brought down on the wall to provide better illumination.

Cork board is shown above the blackboard, and a panel of cork board near the front door. The lines of the door frames, panels, and blackboard frame should be noticed. Since the door height is fixed and the height of the blackboard from



DRAWING NO. 2
Corridor wall of classroom

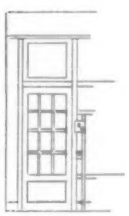


DRAWING NO. 3
Corridor wall of classroom with storage cabinet

the floor is a variable, alignment at the top is impossible in all rooms, if the same width of blackboard and cork board is used, but the effect can be very pleasing or otherwise. One type of door is shown. Classroom doors can add much to the appearance and usefulness of a room.

Drawing No. 3 shows the same wall with a teacher's cabinet 4 feet wide. Its location is probably bad, but the architect should be told where to place it. Note that the top of the drawer space carries out the line of the chalk trough; and the top of the cabinet, the frame line of cork board. The upper part of the door has been treated to carry out the blackboard line and the door panels.

The height of this case will vary with the blackboard height, but by changing the height of the drawer section, the details of the cabinet, and its relation to other factors, need not be disturbed.



DRAWING NO. 4
Classroom with transom

The doors of this cabinet are glazed, but may be covered with cork board to conserve blackboard space.

Drawing No. 4 shows the door at the front of the room with telephone and light switches located between it and the blackboard. This drawing was made to call attention to a proper location for a telephone. It should never be in a corner.

This drawing also suggests a statement concerning a transom over the door. The transom serves to help light the corridor or to aid in ventilation, but its usefulness is doubtful.

Drawing No. 5 shows the rear wall of the classroom. It is left clear in this instance, but may be used for bulletin boards, pictures, and display.

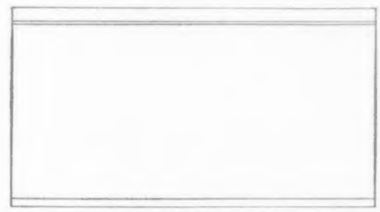
Diagrams 5a and 5b were made up from two statements of requirements.

The requirement for 5a stated, "A bulletin board 4 x 6 feet should be located in middle of rear wall to match blackboard height." This one was drawn to match the height of the upper molding of blackboard and cork board space, although that may not have been the intention.

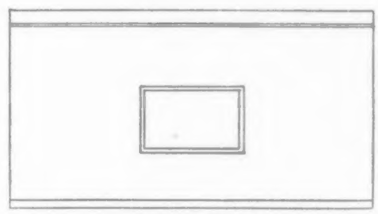
The requirements for 5b stated, "Two bulletin boards 4 feet long, width to match blackboard and cork board, should be installed a short distance from the side walls to allow pictures to be hung in middle." The people who made up these statements of requirements had in mind the problems they were trying to solve, and had an answer, but the correctness of the answer is doubtful.

Drawing No. 6 shows the front wall with the blackboard and cork board above. A shelf may be provided above the cork board, but it is rather high. A map rail above the blackboard should be provided. The moldings at the top of blackboard and bulletin board may be shaped to take picture hangers if desired.

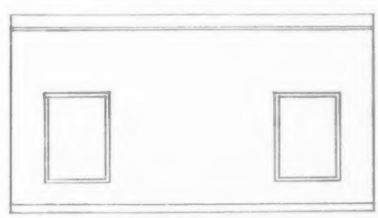
Drawing No. 7 shows the outside wall of the room. The front window is 5 feet from the front wall to prevent reflection. The windows are in groups of three, but the grouping is not important. The glass area begins 4 feet from the floor, and



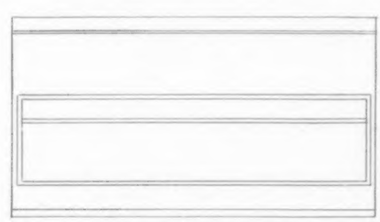
DRAWING NO. 5
Rear wall of classroom



DRAWING NO. 5A
Rear wall of classroom with 4 x 6-foot bulletin boards



DRAWING NO. 5B
Rear wall of classroom with two bulletin boards



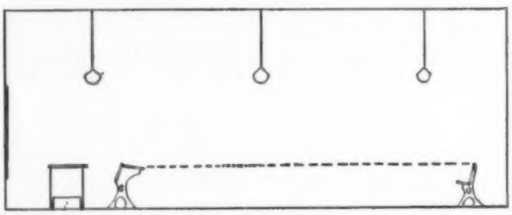
DRAWING NO. 6
Front wall of classroom, showing blackboard and cork board above

the combined glass area is 133¼ square feet, while one-fifth of the floor area is 132 square feet. This drawing calls attention to the amount of window space necessary to provide a glass area equal to 20 per cent of the floor area.

This treatment of window area sometimes interferes with architectural design, but an adequate distance from the front wall and from the floor, and the area of glass, must be required. The windows should come as close to the ceiling as possible.

Drawing No. 8 shows a section of the room through a row of light fixtures if six fixtures are

DRAWING NO. 7
Window wall of classroom; windows 5 feet from front wall and 18 inches from rear wall



DRAWING NO. 8
Problem of artificial illumination

hung symmetrically at a height of 8 feet from the floor. This diagram suggests the area occupied by the children, which should be lighted from left and rear. It shows the blackboard at the front, and suggests, by the teacher's desk, the activities at the front of the room.

Classroom floors demand special study. If fixed desks are to be used, the answer may be one thing; if movable furniture, another. Many types of floors are advocated—hard maple, linoleum, linoleum tile, mastic, rubber tile, colored concrete, asphalt tile, and others. It is wise for the school authorities to make a careful investigation of these materials and determine the relative values in terms of first cost, maintenance, cleanliness, future appearance, noise avoidance, color, and resilience.

Many Other Questions About Classrooms

There are other questions about the regular classroom to be answered. Among them are the following:

1. What wood shall be used in the trim? How shall it be finished?
2. What type of window shall be used? Shall the sash be metal or wood? Shall all or part of the glass be clear? Shall the sill be wood, marble, slate, brick or plaster?
3. What kind of finish should be used on the plaster?
4. Shall the ceiling be plaster, metal, or painted concrete? Shall it have acoustical treatment?
5. How shall the children's wraps be cared for? Lockers in corridors? in room? cloak halls? wardrobes in rear of room? at side? in front? How shall these items be ventilated?
6. What storage shall be provided?
7. What type of light fixture is most desirable? Shall chains be used to suspend them? What illumination is demanded?
8. What color scheme is best when considered with wood trim, furniture and floor? What is best in service? What material shall be used?
9. What is necessary to heat and ventilate the room properly?
10. What type of shades shall be provided?
11. What electric outlets will be needed?
12. Shall there be provision for loud speakers, etc?
13. Shall door checks be provided?

When it comes to rooms for special subjects such as sewing and cooking, a definite statement of needs is necessary because the dimensions of these rooms are not well standardized by use.

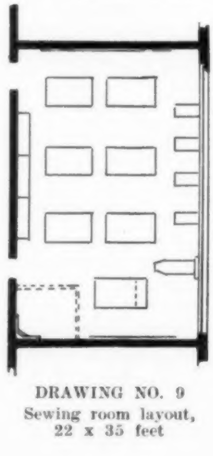
Sewing and Cooking Rooms

What are the proper dimensions of a sewing room? One writer says, "A sewing room should be 48 feet long."

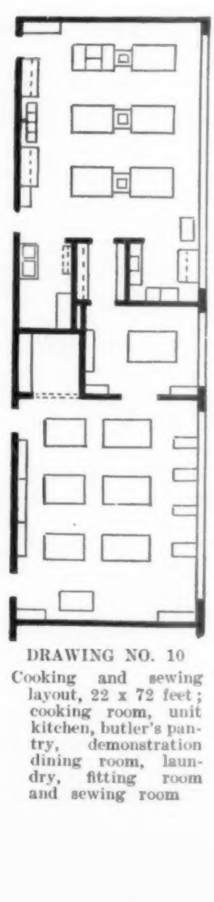
How many children and of what grades will use the sewing room? What equipment is desired? Will the rooms be used for other purposes, such as science, art, or library? The answers to these, and other questions, will definitely determine the size of the room. It may be that a much smaller room will house this activity and allow the space to be used where it is more necessary.

The minimum distances between tables, the type and location of equipment to take advantage of illumination, space required for supervision, should all be settled. This is the time for su-

6 four-pupil tables
1 cutting table
3 display and storage cases
4 sewing machines
1 ironing board
1 triplicate mirror



DRAWING NO. 9
Sewing room layout, 22 x 35 feet



DRAWING NO. 10
Cooking and sewing layout, 22 x 72 feet; cooking room, unit kitchen, butler's pantry, demonstration dining room, laundry, fitting room and sewing room

perintendents and teachers to visit and study other sewing rooms, inspect plans of other buildings, and to talk over the advantages and disadvantages of certain dimensions.

Continuing to use the sewing room as a problem, drawings 9 and 10 will illustrate possible solutions.

Drawing 9 shows a sewing room with an accommodation for 28 pupils. The room is 22 feet by 35 feet and contains the equipment listed.

The fitting room is made by curtains which slide on rods suspended from the ceiling. When not used as a fitting room, the floor space is available for other activities.

Drawing 10 shows adjoining cooking and sewing rooms. The total space is 22 x 72 feet.

The sewing room contains:

6 four-pupil tables	1 filing cabinet
4 sewing machines	1 teacher's desk
4 display cases	

The fitting room contains a large storage case. The demonstration dining room is available to both activities. The dining room is entered from the cooking room through a butler's pantry. The unit kitchen is immediately adjoining. Next to the fitting room is a demonstration laundry with stationary tubs and a dryer. The ironer is stored here and the washing machine when in use is placed in front of the tubs.

The cooking room contains six four-pupil tables, three cabinets or storage cases, a bank of ovens, a refrigerator, and a filing cabinet.

The unit kitchen contains a cabinet, a range, and a sink with double drain board.

The answer to the question which heads the article has been suggested in the items discussed or for which drawings are shown. The answer is this: School people should make a definite statement of the activities and organization to be housed, translate this statement for the architect into one of dimensions, relations, and material requirements, so that by this cooperative effort, each school building will properly house the school's program.

Pittsburgh's Forty-Story "Cathedral of Learning"

BY JOHN WEBER

BUSINESS MANAGER AND SUPERVISING ENGINEER, UNIVERSITY OF PITTSBURGH

THE University of Pittsburgh campus is located on high ground about three miles from the "Golden Triangle," Pittsburgh's principal business district. The campus forms part of a great civic center where are located many public and semi-public buildings, including the Carnegie Library, the Carnegie Museum, the Carnegie Institute of Technology, the Soldiers' and Sailors' Memorial Hall, the University Club, the Pittsburgh Athletic Association, the Masonic Temple, the Knights of Columbus Building, the Twentieth Century (Women's) Club, and many church edifices. In the immediate vicinity are Schenley Park, many fine residences, and high-class apartments.

In the center of this development and at the main entrance to the park is a 14-acre tract of land which is to be the center of the University activities. The appraised value of this tract is $300,000 per acre. The site is one city block from the main entrance to the present campus development of 67 acres.

The Structure Expresses Creative Aspiration

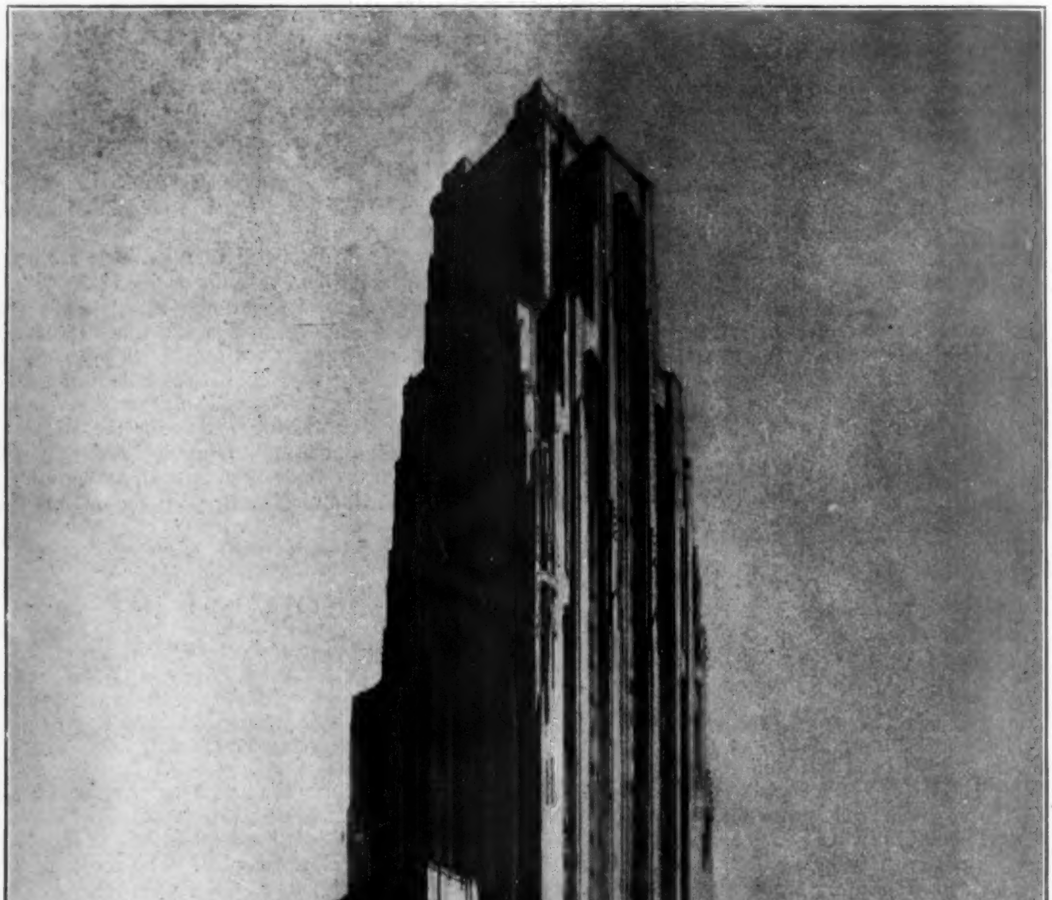
The character of the development of this ideal site, to quote Chancellor Bowman, had to satisfy "the desire for economy, permanence of construction, and educational effectiveness." The solution of the problem was his conception of a high building, a fine Gothic structure, one that "would express through the characteristic qualities of Gothic architecture the spirit or purpose of all that should go on within a university."

C. Z. Klauder, of Philadelphia, was engaged as architect to develop the plan. The result is the design of a forty-story Gothic structure. The plan is daring. It departs from the traditional in college buildings. Its architectural quality is such that it promises to satisfy the dream of the Chancellor when he said, "The structure is to be like a great symphony. Forceful, unafraid, sublime with a sense of upwardness, it will start our accustomed limits of thought and life to move farther away. The unmeasurable quantity of its lift, buttress after buttress rising but never arriving in a spire, will suggest force enough to go still beyond themselves, make us apprehend that the power to create and achieve is the source of the value of education and of life. The plan is a building which shall be a fitting and central symbol of the topmost, high motived energy and reverence in Pittsburgh."

The building is called the Cathedral of Learning, a name suggested partly by its Gothic architecture and partly by the idea that it "is to be a seat or central symbol of creativeness and of achievement in the Pittsburgh district."

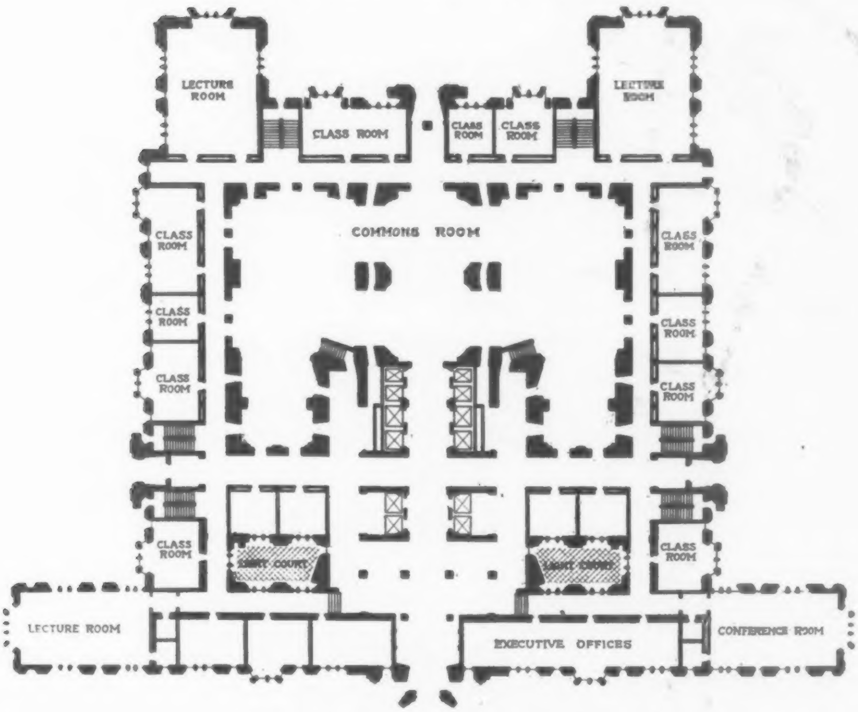
Plan and Arrangement

The structural steel frame and the concrete floors of the building are completed. The walls of Indiana limestone are in the process of construction.

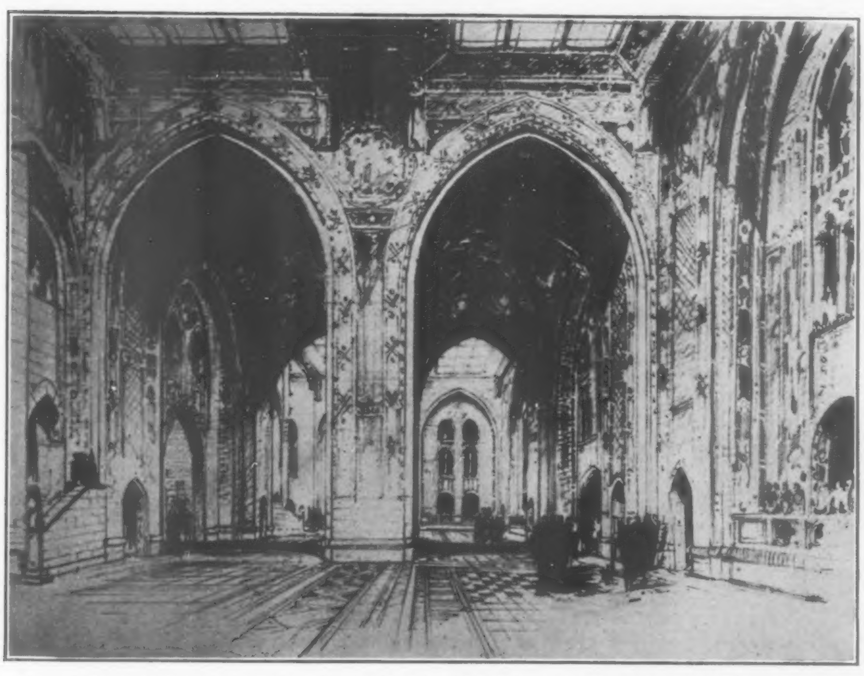


CATHEDRAL OF LEARNING, PITTSBURGH, AS IT WILL LOOK WHEN COMPLETED

CATHEDRAL OF LEARNING
UNIVERSITY OF PITTSBURGH



FIRST FLOOR PLAN
DISTANCE ACROSS FRONT WINGS 335 FEET



ARCHITECTURAL STUDY, THE COMMONS ROOM, CATHEDRAL OF LEARNING

AIRPLANE VIEW OF THE DISTRICT IN WHICH THE CATHEDRAL OF LEARNING IS LOCATED

The building will have a gross cubage of over 8,000,000 cubic feet. The base is 225 feet square, with projecting wings on the front side, making the over-all dimension of the front façade 325 feet. The main tower section of the building is 84 feet square and rises to a height of 519 feet. The gross floor area within the building is 581,000 square feet.

The plan of the interior calls for a great commons room on the first floor. This room has a floor area of over half an acre. It is 52 feet high and surrounded by three levels of class and lecture rooms.

It is planned to devote the fourth to eighth floors to student activities, student recreation rooms and departmental libraries. The zone from the ninth to the thirty-fifth floor will be devoted to laboratories, science departmental libraries, engineering drawing rooms, faculty offices, and graduate research. It is planned to use the topmost zone of the building for faculty club and recreational facilities.

The basic idea which governed the planning of the interior called for the locating of the more densely occupied rooms on the lower floors and the more sparsely occupied rooms on the upper floors. As a result, it is indicated that the center of population of the building will be at about the sixth floor.

The building will be served by twelve elevators. The elevators will run at a speed of 700 feet per minute and have a carrying capacity of from 20 to 24 persons each. As may be noted above, the undergraduate classrooms are confined to the first three floors. These floors will have no elevator service, it being assumed that the between-class movement of students may be accomplished as in any low type of college building. Careful calculations indicate that the twelve elevators will be more than adequate to serve the building above the third floor level.

The ultimate development of the Cathedral of Learning site calls for surrounding the building with a quadrangle of three- and four-story buildings. These buildings will be erected near the outer edge of the plot. The arrangement will leave numerous courts between the main building and the surrounding small buildings, with the main court in front of the Cathedral about 300 feet x 240 feet. The low buildings include the main library building, a chapel, science building and dormitories. The aggregate cubical contents of the surrounding low buildings will be about equal to that of the high building.

Recent Tendencies in School Architecture in Germany

BY WERNER HEGEMANN

EDITOR, "STÄDTEBAU," BERLIN, GERMANY

SINCE the war, German school building has been somewhat influenced by American models. Not in regard to exterior appearance: the style most used in America, the Tudor or Collegiate, during its period of historic growth never had a home in Germany (nor in America, for that matter). Today it is regarded as a mongrel style—half Gothic, half Renaissance—and is in Germany thoroughly disliked, like all architecture copying the manner of centuries past.

But an effort is being made to follow American example in installing classes for advanced students, in building more special rooms for the teaching of the natural sciences, cooking, arts and crafts; to increase the gymnasiums and their dressing-rooms, to annex baths and shower-baths, to create departments for dental care, for feeding the children between school hours, etc. All these additions have increased by about one-half the covered space required for each child, not to speak of the loggias for transferring the lectures into the open air during the warmer season, and other desirable additions. Furthermore, about two square yards of outdoor playground are figured for each child, as well as some gardening space, which also is desirable.

The Financial Question

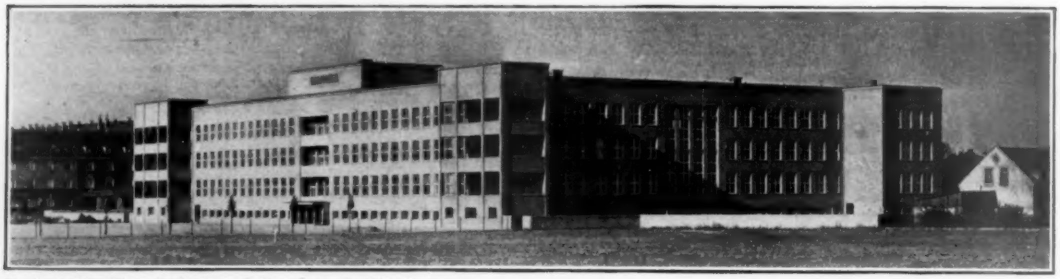
The effort to provide for these new requirements is greatly handicapped by lack of funds. The financial calculations and the question how to build cheaply take most of the time of school architects and school authorities. The question of expense is especially serious on account of the fatal interior migration that is taking place in Germany. It is true that the birth statistics since the war show the most momentous decline any country ever experienced; the German excess of births over deaths is now smaller than in any other country, including France. The number of births in the cities is even considerably lower than the number of deaths. At the same time, however, an increasing flight from the rural districts makes the cities grow rapidly and forces the most serious school problems upon them.

Corridors and Number of Stories

The debate on how to save in school building, centers around different types: the corridor type with classrooms on both sides or on one side only, the pavilion type, the multi-storied and the one-storied type. The corridor with rooms on both sides is claimed to be the cheapest, but its opponents, who have done fine work in Frankfurt on the Main, point out that this middle corridor is either dark and poorly ventilated or must be so wide as to make its economical advantage doubtful. Even a wide interior corridor with windows only at its ends—one of them may even be obscured by the stair-hall—is apt to give

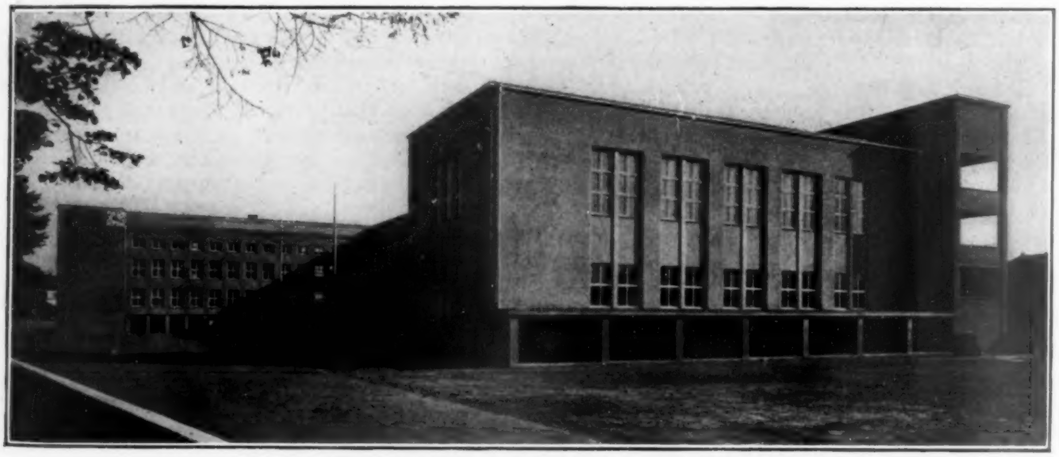
Mebes and Emmerich, Architects

PLASTER MODEL, PUBLIC SCHOOL, BERLIN WEDDING

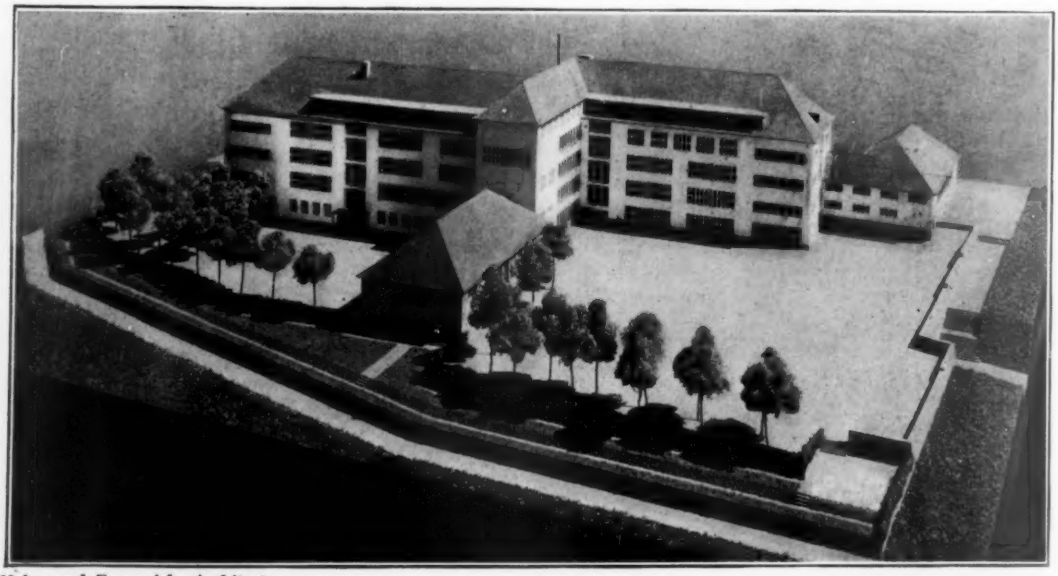


Paul Wolf, City Architect of Dresden, Architect

PUBLIC SCHOOL NO. 45, DRESDEN-REICK



ANOTHER VIEW OF PUBLIC SCHOOL NO. 45, DRESDEN-REICK



Mebes and Emmerich, Architects

MODEL OF PUBLIC SCHOOL, APOLDA

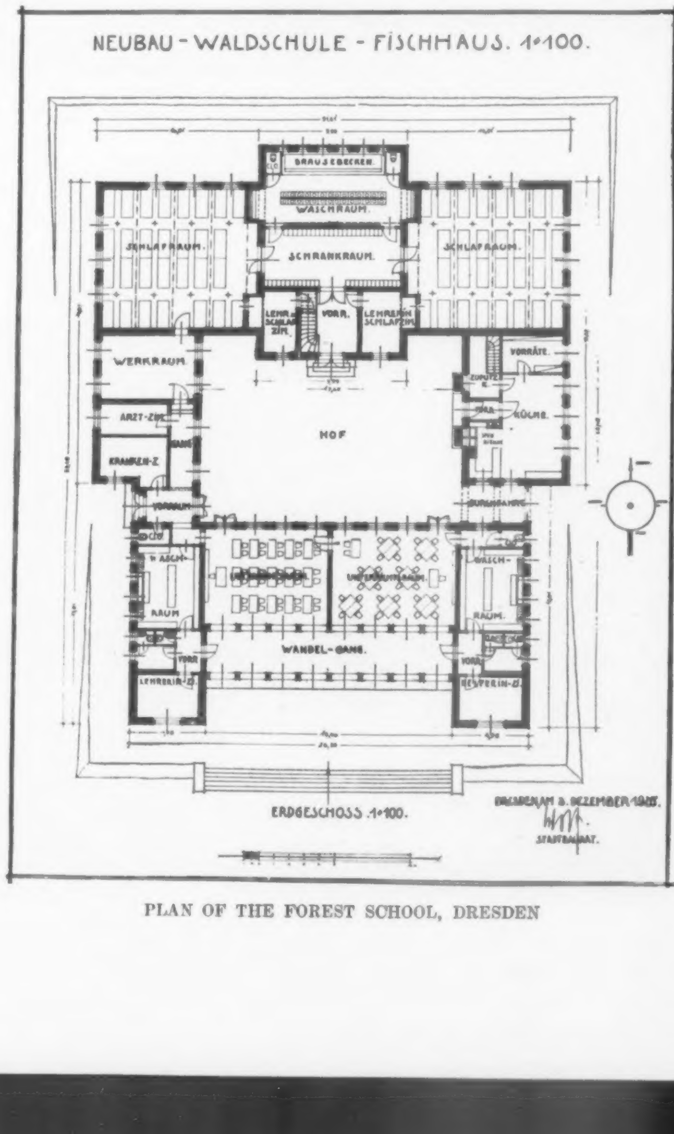
Paul Wolf, Architect

FOREST SCHOOL, DRESDEN

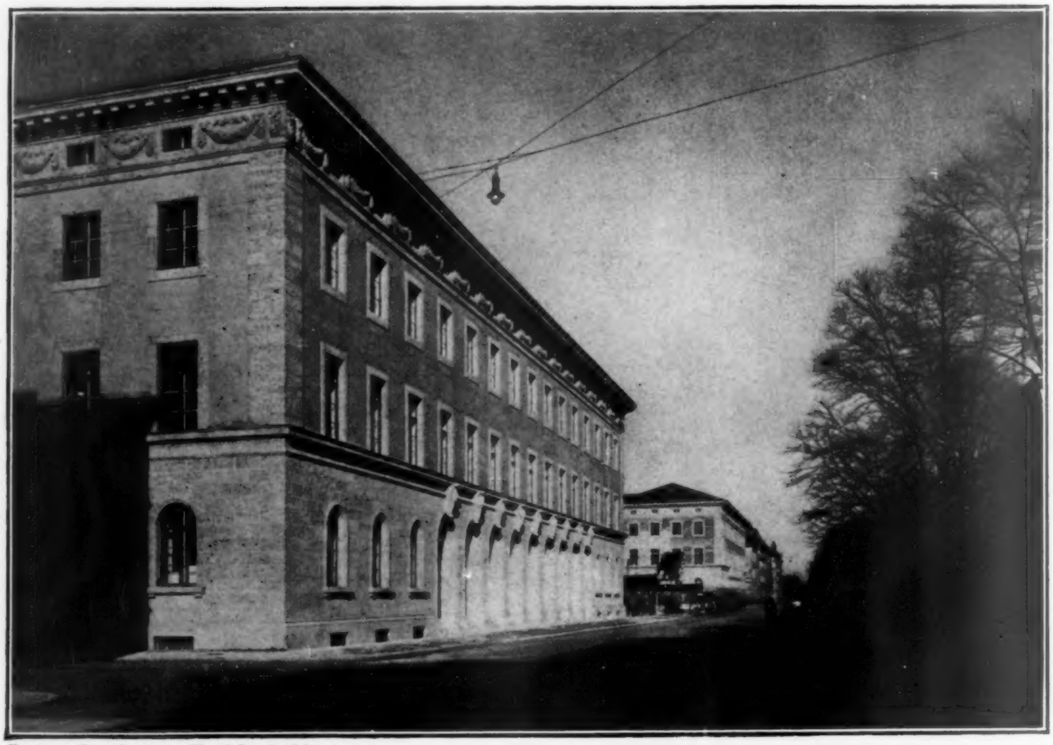
something somber and unpleasant to the school, which ought to be light and pleasant in every spot.

The multi-storied type of school is figured to be economical because the number of expensive rooms for scientific teaching, etc., can remain the same, even if the number of students is doubled; also, the area required for a school is smaller if a larger number of stories is piled upon it. Against this, the advocates of the single-storied school point out that a multi-storied school gives the effect either of a palace or of a military barrack, and that Germany had too much of both long before the war. As to the saving of ground space, that is, the economy in real estate, the opponents of the barrack type can point out that every German city today follows the American example of acquiring large areas for parks and provides a "green girdle" encircling the city and penetrating radially into the city. In these extended park lands, places fit for low school buildings can easily be found. Park as well as school can be benefited by this choice, especially as the new schools almost always have to be built in new suburbs near the new park lands. The latter can be brought into pleasant relation to the schools, as in olden times the parks were brought into delightful relation to the country-seats and *maisons de plaisance* of the princes.

By selecting the single-storied type, considerable savings can be made by omitting the stair-halls (which the fire-police require to be wide) and by more economical foundation walls, etc. In fact, a single-storied school built by the city of Cologne is calculated to have been by 20 per cent cheaper than the customary multi-storied type. The city of Frankfurt on the Main figures that the single-storied school is by 12 per cent more expensive than the

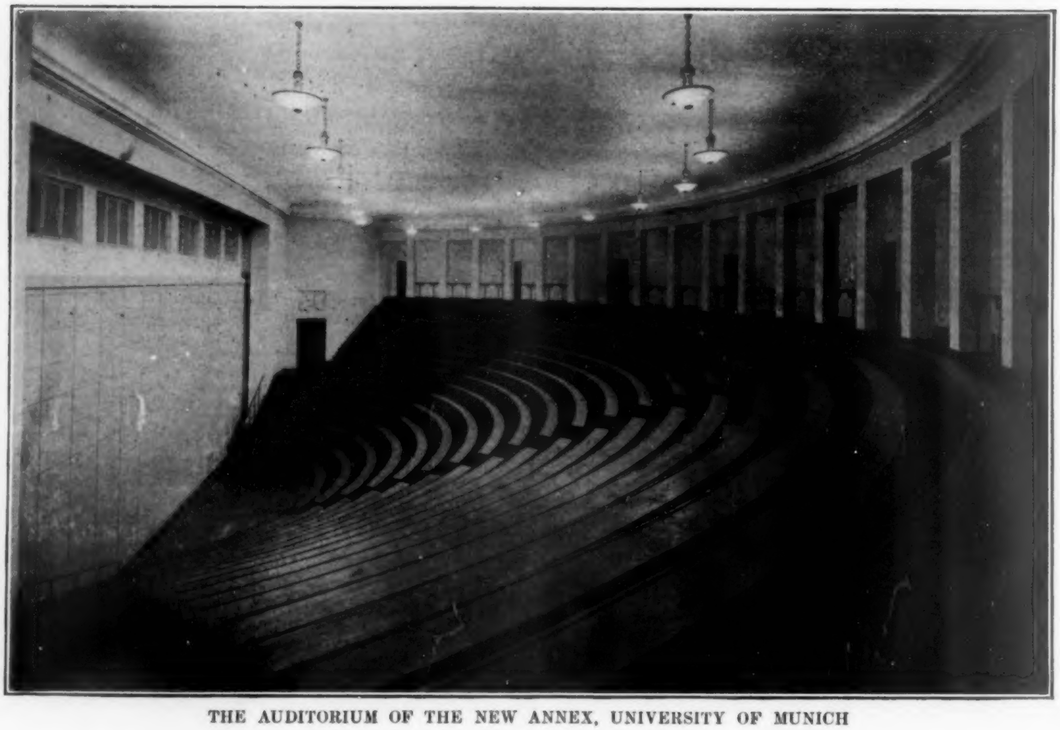


PLAN OF THE FOREST SCHOOL, DRESDEN



German Bestelmeyer, Munich, Architect

NEW ANNEX, UNIVERSITY OF MUNICH



THE AUDITORIUM OF THE NEW ANNEX, UNIVERSITY OF MUNICH

multi-storied one, but that this additional money is well spent.

The Pavilion Type

The desire to do away with the huge barrack or palatial type of school has led further to the pavilion type, which groups only four classrooms (mostly for special teaching) into one low building and connects these individual and inexpensive structures by long and partly open, but always covered, corridors with each other, with the homes of the teachers and with the main building. The pavilion type gives the advantage of sunlight from two sides, the intimate connection through sliding doors with the surrounding garden, and plenty of play-space to each child.

Classroom Seating

The effort to overcome the military spirit that has done so much harm also in Germany, affects the interior arrangement of the classrooms just as much as the plan of the whole building. In many schools the old-fashioned benches have disappeared, and the new chairs and tables that take the place of the benches are not lined up any more like the soldiers of a regiment facing the drilling officer, but are grouped in a round-table fashion so as not only to facilitate the friendly intercourse between teacher and pupils but also to transform the class into a social gathering in which the comrades can see each other and vie in competitive goodfellowship.

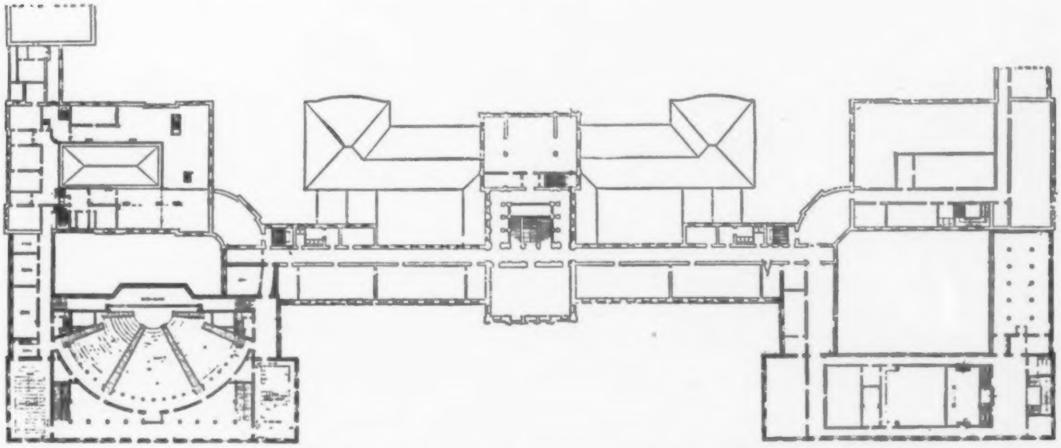
The Central-Gymnasium Type

Another school-type was initiated by the city of Celle and has been much discussed. It groups all classrooms around the central gymnasium, which receives light through the ceiling. The school authorities in Denmark, where the architects wanted to copy this school-type, have declared the ventilation of the very impressive central gymnasium insufficient, not to speak of the high walls making any view into surrounding nature impossible.

In Dresden private donors have made it possible to create a municipal forest-school for weak children, who can be kept there day and night all the year round. The classrooms are so arranged that they can serve also as play- and dining-rooms, while the dormitories and washrooms are taken care of in special tracts.

More Space Needed for Universities

Just like the schools, the German universities since the war have suffered seriously from lack of space, the number of students having in many cases doubled. As the German universities in most cities are historical buildings in the inner and crowded part of town, extensions are difficult and lectures often must be given in rather miserable quarters rented in old tenement houses adjoining the universities. In Munich, however, some very dignified new auditoriums could be annexed to the "Technical High School" (corresponding to that part of an American university in which the engineering sciences are taught). The inestimable appreciation the recent American Ambassador to Germany, Dr. Schurmann, and his American friends have professed for German science makes it at present possible for the historic University of Heidelberg to build an important new building adjoining her old premises.



UPPER FLOOR PLAN OF THE NEW ANNEX, UNIVERSITY OF MUNICH

Steel Joist Floor and Roof Construction for School Buildings

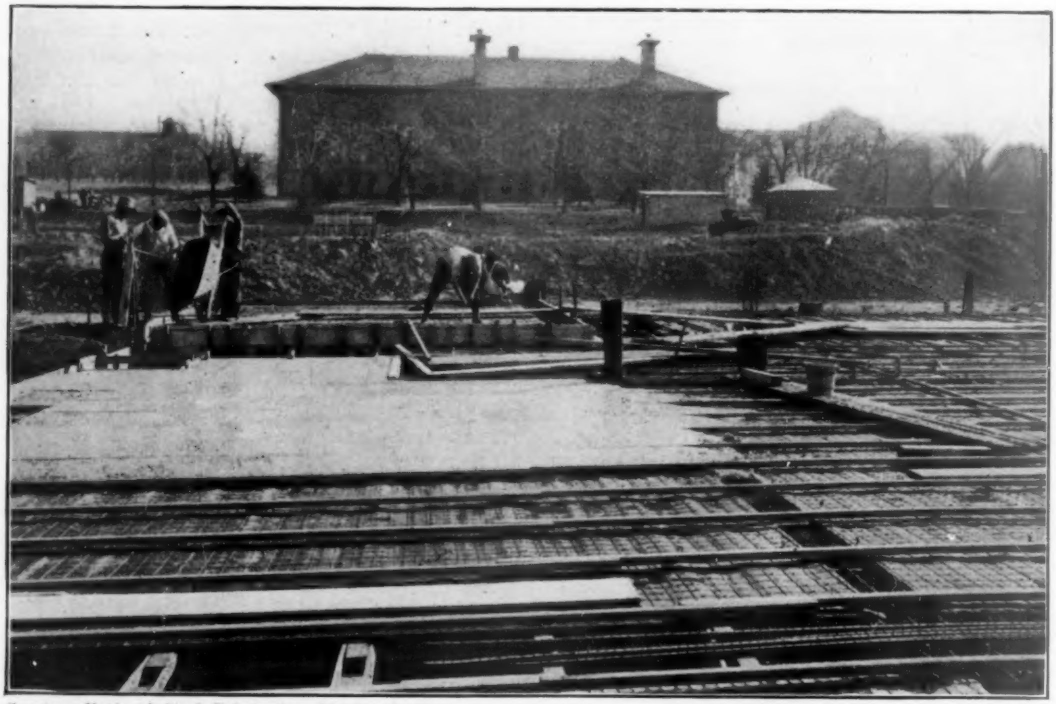
BY TYLER STEWART ROGERS

ONE of the most interesting developments in recent years in the design of school buildings is the success which steel joist floor and roof construction has achieved in this field. Fireproof construction at relatively low cost has long been needed for educational buildings of almost all types and grades. Fire safety is a prime requisite of school buildings, and, unfortunately, budgets for school construction never seem large enough for consideration of anything but the basic necessities.

Steel joist floor construction employs non-combustible materials throughout; it is rapidly and easily erected; it is lower in cost than any other type of fireproof design that has yet been developed, and constitutes a rigid, strong and soundproof construction.

Reduced to its simplest terms, steel joist floor construction consists of light-weight floor beams made of rolled, welded, or otherwise fabricated steel joists, which replace the ordinary wood floor joists in non-fireproof construction. These steel joists, which will be described later, are laid on supporting walls of masonry or connected to the structural steel framework. Over these joists there is built a slab of concrete or gypsum two or three inches thick, which constitutes the structural floor, and this in turn may be surfaced with wood, linoleum, rubber and similar compositions, or merely painted. The underside of the steel joists carries a metal lath and plaster ceiling, which effectually fireproofs the floor from below.

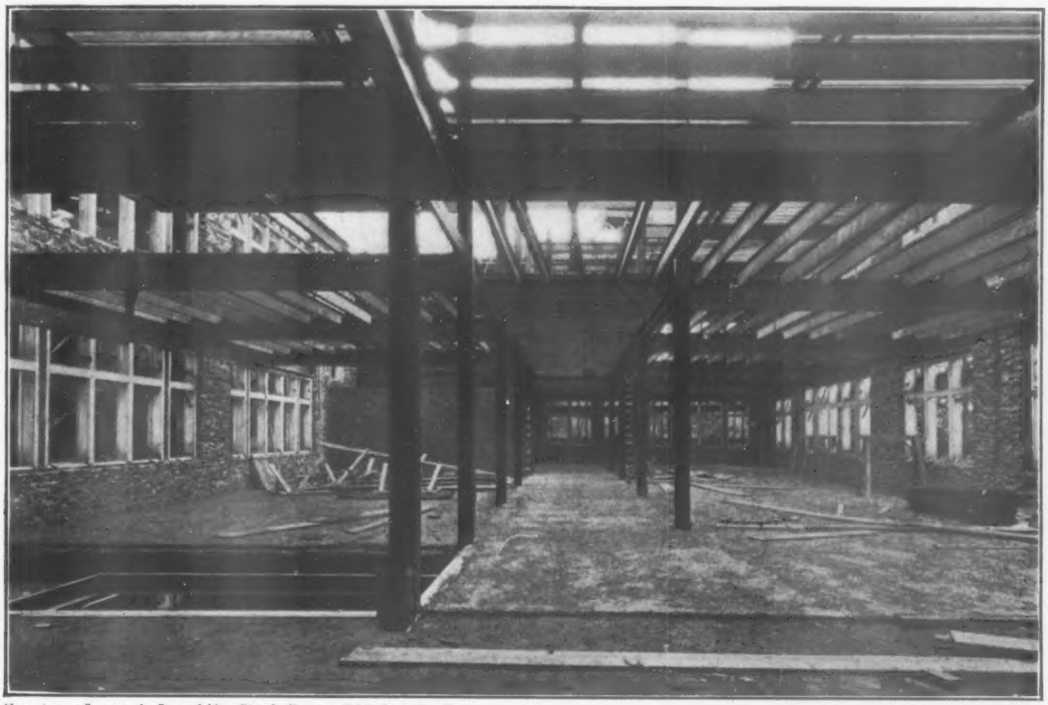
The assembled floor made up in this way weighs from 40 to 55 pounds per square foot, which is very much less than the dead weight of a concrete arch such as has been employed in the past to span the distance between structural steel beams. This diminished dead load of the floor requires less strength in the supporting walls and framework and less supporting power in the foundations. Naturally, there is a substantial economy in all the structural materials used for these purposes. The elimination of riveting and other expensive attachment methods reduces labor cost in erection and shortens the time required for framing the building. Other economies will be



Courtesy National Steel Fabric Co., Pittsburgh, Pa.

POURING CONCRETE SLAB, WITHOUT THE USE OF FORMS, OVER WELDED WIRE MESH, FIBROUS-BACKED REINFORCING MATERIAL, SUPPORTED BY STEEL JOISTS, IN THE UNION BUILDING, UNIVERSITY OF UTAH

The wood sub-floor will be nailed to the wood strips shown, and over this may be applied linoleum, rubber tile, hardwood strip flooring or decorative wood tiles, or other desired finished flooring



Courtesy Jones & Laughlin Steel Corp., Pittsburgh, Pa.

STEEL JOISTS OF THE SOLID WEB TYPE WERE USED FOR CONSTRUCTING THE FLOOR SYSTEM IN THE ROSEMONT COLLEGE BUILDING, ROSEMONT, PA.

In the left foreground the thickness of the slab is visible and also the projecting edge of metal lath upon which the slab is poured

discussed in detail later which are the result of inexpensive methods of casting the concrete floor slab without the use of forms.

Steel joist floors are capable of carrying live loads from 40 to 125 pounds per square foot—in fact, the top limit may be extended to 150 pounds if necessary. This brings them very definitely into the range of load-bearing capacities which are found in school buildings of all types. During the past year or two a large number of schools throughout the country have been built with this type of construction. It is only an occasional machine shop, forge shop or possibly certain types of laboratories that demand floor strength greater than can be economically developed with steel joists.

Types of Steel Joists

The term "steel joist" is applied generically to a wide variety of steel floor members, some of which are called beams and others trusses, and still others metal lumber. The latter classification has apparently diminished in importance since the evolution of the newer types that are now growing rapidly in use.

The simplest form is a light-weight rolled-steel I-beam which is roughly similar in section to an ordinary structural steel member. These "junior" beams have solid webs and flanges and are in all respects, except lightness, like a typical I-beam, and the units are employed in the manner which will be described shortly for ordinary steel joists. Another type of member is made up from a standard I-beam section four or five inches in height, the web of which is expanded under heat after it has been slotted. The result of this expanding process is to form a lattice-shaped series of struts which are integral parts of the upper and lower chords. This distinguishes it from the next type of steel joist, which is assembled or fabricated from a number of separate elements.

The third type of fabricated steel joist takes a number of different forms. The term "truss" is frequently used to describe it, because the appearance of the joist is much like that of an ordinary bridge truss. The top and bottom chords are joined together by means of struts and braces, welded or sometimes riveted to the chords.

The distinction between the various makes of fabricated steel joists lies chiefly in the form of the chord members and in the manner of assembly. It is of little importance to consider the merits of the different assemblies in this article, but it is necessary to point out that in some types of joists the chords are made up of two bars or angles with the web members welded between them so that the chord has a slot along its top face. Other types use T-shaped sections for the chords, with the web members welded to the stem of the "T." In practice, the former type

permits the attachment of the slab reinforcing and supporting materials by means of wedges or clips that are driven into the slot, while the latter types have solid top flanges like an ordinary I-beam and require other attachment devices.

Method of Installing Steel Joists

It must be appreciated that the use of steel joists does not change the ordinary structural design of the walls or framework of a school building, other than to permit lighter construction in proportion to the diminished loads which must be carried. A complete structural steel framework may be employed, using a masonry veneer as for normal types of fireproof construction. The steel joists are merely laid upon the bearing walls, attached to the beams or girders as the case may be, and are spaced at the required distances by hand. They are anchored in place by means of clips or welded to the steel framework or anchors embedded in the masonry. The members, in the case of bar joists, are then braced at intervals of approximately eight feet along their length, either with twisted wire bracing or with some form of rigid bridging which resembles the ordinary diagonal bridging used with wood joists. This prevents the joists from tipping and also helps to distribute the load on one joist to those adjacent on either side. When this process is completed the structural assembly is complete, ready for laying the floor slab.

Joists that have open webs—that is, all types of steel joists except light structural sections—permit rigid conduit for wiring systems and pipe lines for water-supply, heating and drainage to be run through the spaces between the upper and lower chords of the joists with considerable freedom. The light-weight beam, with a solid web, is usually punched at certain points where such pipes or conduits must be carried, or else they are run across the ends of the joists near the wall lines in a space that is cut out from the beam for this purpose. This freedom of installing the mechanical equipment of the building contributes to the economy of construction the system affords and eliminates the need for an extra thickness of floor slab in which conduits or pipes may be buried.

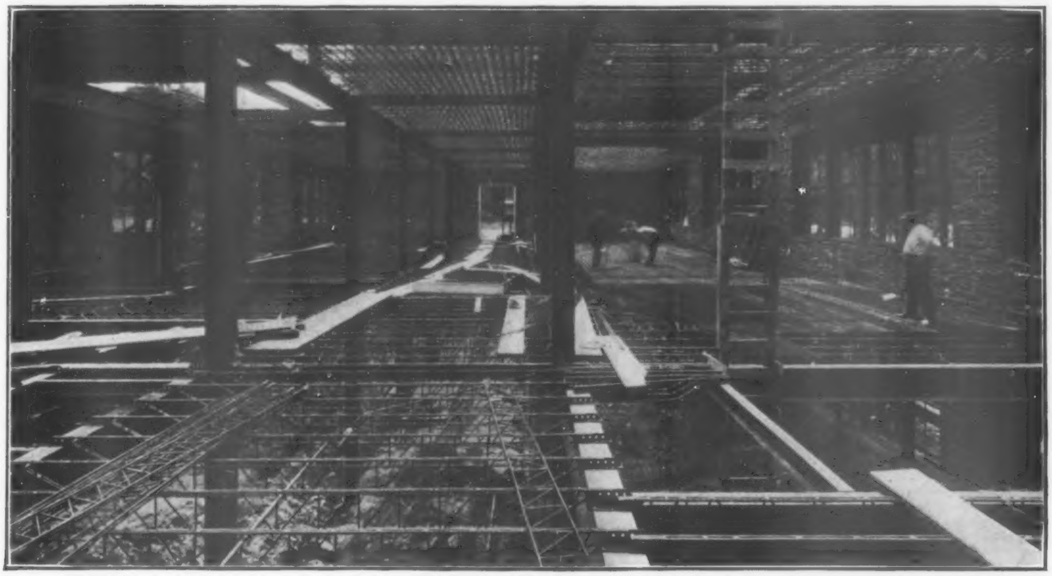
Constructing the Floor Slab

There are three methods of constructing a floor slab over steel joists. The first uses metal lath, which is laid over the tops of the joists and clipped or wedged to the upper chords with various devices manufactured for the purpose. Concrete mortar, mixed very dry, is poured directly over the metal lath to the required depth and finished in the ordinary manner. If the mix is

Courtesy McClintic-Marshall Corp., Pittsburgh

STANDARD RIGID CONDUIT FOR ELECTRICAL WIRING AND OTHER PIPING IS RUN WITH EASE THROUGH THE OPEN WEBS OF MOST STEEL FLOOR JOISTS OF THIS TYPE

This photograph illustrates floor construction, using flat top chord joists and precast gypsum slab, in the Upper Darby High School, Delaware County, Pa.



THE JUNIOR HIGH SCHOOL AT WYNCOTE, PA.
Round top chord, welded type, and fabricated steel joists are used with steel structural frame and masonry wall construction. The short steel rod placed through the end of every third joist is embedded when the brick wall is built around the flanges, thus firmly anchoring these members. All joists are braced by metal bridging for added rigidity and to prevent displacement

not too wet, only a small amount of the mortar drops through and is wasted on the floor below. This system has been in successful use for a number of years.

The second method employs a new type of reinforcing fabric with a heavy, fibrous backing which was designed especially to be used with steel joists for concrete floor and roof construction. The material consists of a heavy, galvanized wire fabric to which is attached a fibrous backing material which somewhat resembles an exceedingly heavy building paper. The material is rolled out in long sheets across the joists so that the paper is on the underside of the steel fabric. One end of the sheet is then firmly attached to a beam or joist, and the other end stretched taut across the intervening spaces by means of a simple stretching mechanism. The fabric is then clipped to the intervening joists and the process repeated until the entire floor area is thus covered. Concrete is poured directly on this material, the fibrous backing being of such strength and waterproof character as to support the concrete during the setting process, even when a relatively wet mix is used. This not only permits the adoption of any desired water-cement-ratio, but eliminates wastage of cement. Naturally, the weight of the concrete mix presses the fibrous backing away from the steel fabric a matter of ¾-inch or less. The steel thus becomes embedded in the lower part of the slab and the whole constitutes a strong and rigid floor.

The third method of building the structural floor slab does not use concrete at all, but employs pre-cast gypsum blocks, which are laid over the top chords of the joists. These pre-cast slabs usually have reinforcing steel which projects at the ends so that the steel of each adjoining slab may be twisted together to form a continuous tie across the floor space. The joints between the slabs are grouted or filled in with a gypsum plaster. Similar construction is sometimes used for the ceiling beneath, the only difference being that the pre-cast slabs are hooked on to the lower chords of the trusses and the joints are filled or grouted from above before the top slab is laid.

Ceiling Construction

Except where pre-cast gypsum slabs are used for ceilings, the ordinary method of protecting the underside of the steel joists is to attach metal lath to the lower chords and to plaster in the usual manner. Another material employed for the purpose is a fibrous-backed wire mesh similar to that already described for floor reinforcement, except that the product is manufactured in sheets, with V-shaped stiffening ribs behind the backing to prevent bulging or sagging. When plaster is applied to this type of base, the plaster presses the fibrous backing away from the wires, embedding them in the heart of the plaster slab, where they function like reinforcing in concrete work.

Floor Finishes

The simplest floor finish is a granolithic surface poured over the structural slab and troweled or floated to a smooth finish ready for painting. A concrete floor of this type is seldom accept-

able for typical school areas. It is appropriate for corridors and for certain types of manual training shops and laboratories. Terrazzo may be laid in a similar fashion where a more attractive surface is desired. Likewise, ceramic tile may be laid directly over the structural slab.

Ordinarily, a more resilient type of floor is desired in classrooms, auditoriums, libraries, or gymnasiums. If wood flooring is desired, this may be secured by either of two methods. The first requires the embedment of sleepers or nailing strips in the structural slab, the construction of which has been described above. This is accomplished by setting these wood strips in chairs or supports which rest on the metal lath or reinforcing fabric. This is done before the slab is poured, and subsequently the concrete is leveled off even with the top of these "screeds." Sometimes an underfloor of wood is nailed to these sleepers and then the top finished floor of hardwood applied above, but more often the finished floor is nailed directly to the sleepers or screeds.

A more recent method of applying a hardwood floor over concrete employs rectangular or square blocks of hardwood made up of assembled strips of flooring which are joined together by means of a steel spline on the underside. These blocks or tiles of hardwood have tongues and grooves around the side and are laid on the concrete slab in a special mastic which permanently retains its resilience and adhesive power. Certain types of blocks made in this manner are also chemically treated to minimize warping and shrinkage under changes of humidity. The resulting floor is of interesting pattern, resilient, and resistant to wear.

Other methods of surfacing the floor areas of classrooms where a resilient finish is wanted include the use of linoleum in sheet or tile form, rubber tile, asphalt tile, or compressed cork. In each case these materials are cemented to the concrete slab with or without an intervening layer of felt. The properties of these materials are too well known to demand further discussion.

Roof Construction

Obviously, steel joists may be used for the structural roofs of school buildings just as they are used for floors. Even sloping roofs are built with these members, but where the pitch is too great to permit the casting of concrete slabs, it is customary to use either the pre-cast gypsum slabs or to employ a wood plank roof. When the latter is used, the steel joists are supplied with a wood nailing strip attached to their upper chords.

Experience has shown that steel joist floor and roof construction is eminently suited to school buildings of all types. Insurance companies rate this construction very favorably as to its fireproof qualities, and building codes generally accept it for all buildings having light loads. Only a few cities like New York have not yet permitted its adoption in their fire zones, but it is significant to note that even skyscraper office buildings, and many multi-storied hotels and apartment houses having steel joist floors have been and are now being erected in many sections of the country.

ONE OF THE TOWERS OF RADIO STATION KOAC AT OREGON STATE COLLEGE, CORVALLIS
The Engineering Laboratory at the left, the north wing of the Physics Building, and the Mines Building all have some connection with the station

The Broadcasting Plant of a State College

BY EDWIN T. REED

EDITOR OF PUBLICATIONS, OREGON STATE COLLEGE

KOAC, the broadcasting station of Oregon State College at Corvallis, is architecturally not especially imposing. Its efficiency as a means of carrying the message of the College to the people, however, is not directly dependent upon its architectural grandeur. It fits nicely, almost intimately, into the engineering center of the campus, and from this strategic position picks up its many-sided message and hurls it unobtrusively into space—to fall like manna from the skies for those who care to pick it up.

From the Library, which is the heart of the east campus, the radio towers are seen just to the north, rising from the stair-wells of the Mines Building and the Engineering Laboratory. The main studios, the operating room, and the transmitting equipment are located in the Physics Building, which joins the Mines Building on the south and extends northward toward the Engineering Laboratory. Remote control connections are established with the Memorial Union, the Men's Gymnasium, Bell Field, and the Band Hall on the campus and with a theater in the city.

The present 1,000-watt station did not spring, like Minerva, full-grown from the institutional brain. It was a growth. It had its initial impulse in a 50-watt, homemade outfit built in 1922 by Jacob Jordan, Associate Professor of Physics. This in turn was succeeded by another campus-built system of 500 watts, constructed in the laboratory in the summer of 1925, and put into operation in the fall of that year. Regular programs were broadcast from then on, with the Physics Department in charge of operation, and the College Extension Service responsible for preparing and directing the programs, under the immediate direction of Wallace L. Kadderly.

All this was frankly experimental. The College was not yet assured that educational broadcasting was important enough to warrant its occupying the field, or that a worthy place on the air would be available for it if it sought to develop its station. By the time the new Physics Building was being planned in 1927, however, all this had changed. College stations throughout the country were already occupying their own peculiar field almost as successfully as the commercial stations were occupying theirs. KOAC was very generally urged to broaden its program, secure a more favorable wave-length, and improve its equipment so as to serve every corner of the 97,000 square miles of the state. Accordingly, arrangements for a new modern station were provided in the original plans for the Physics Building.

Definite answer to the petition of the College for a favorable wave-length and adequate opportunity to broadcast was so long delayed, however, that hope of providing a strictly modern station was practically abandoned; but the plans of the Physics Building provided space that could be used without any serious alterations. Hardly had the building been completed, in fact, when the College was given permission to establish a 1,000-watt station under the designation KOAC, broadcasting on a wave-length of 560 kilocycles, which was free from all local interference, and with no restrictions as to time on the air. Installation was rapidly pushed forward and the new station was ready for its new place on the air in the early fall of 1928.

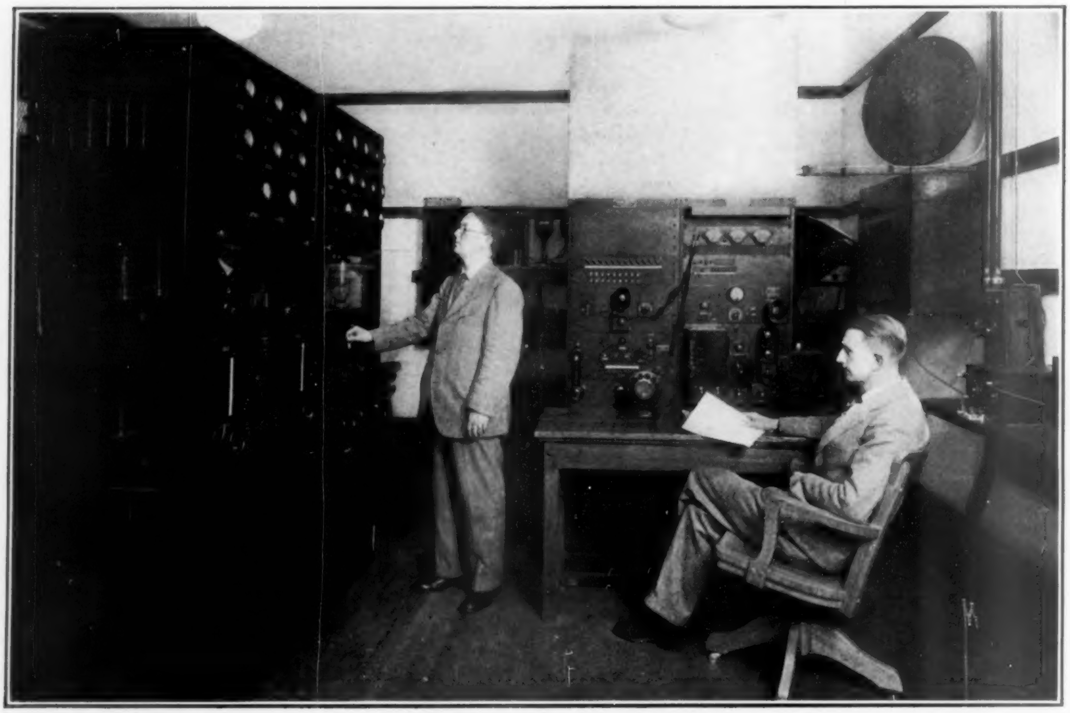
The New Station and Its Equipment

The station consists of a main studio 26 by 29 feet, a smaller studio 12 by 13 feet, the announcer's room 11 by 7 feet, the waiting room 18½ by 9 feet, and the operating room 22 by 17½ feet, with a motor generator room adjoining and a somewhat spacious corridor between the studios and the operating room. The walls of the studios are completely covered with Celotex, to reduce the reverberation period to less than one second. The floors are covered with cork linoleum for the same purpose. The announcer's room is so situated that the waiting-room on the one hand and the two studios on the other are in full view through double plate-glass windows. All the rooms are supplied with an abundance of fresh air through the fan room in the basement. The studios are equipped with suitable furniture, rugs and drapery that give them an inviting, homelike appearance.

The announcer's table is provided with electric phonograph pick-up for broadcasting records; with signal-light, buzzer and telephone connections with the operating room; with buzzer connections with the studios and the waiting-room, and with an outside telephone. A loud-speaker is connected with the monitor amplifier in the operating-room, and another is placed in the waiting-room for the convenience of those who may be waiting their turn at the microphone, or for the friends who may accompany them.

The 1,000-Watt Transmitter

The most important part of the broadcasting station, of course, is the 1,000-watt transmitter. At the time it was installed, it embodied all the latest developments available in transmission equipment. It is known as the One Kilowatt Western Electric D-87737 type. Its distinguishing element is the crystal control unit, the purpose of which is to hold the station accurately on its assigned frequency. This control unit consists of two quartz plates cut from clear crystalline quartz, which has a natural frequency of vibration of 3,000 kilocycles per millimeter thickness. Since the frequency of oscillation of a quartz plate varies with the temperature, the specified working tempera-



THE OPERATING ROOM OF KOAC

Professor Jacob Jordan, of the Physics Department, in charge of operation, is standing by the transmitter. Grant Feikert, operator, is at the desk

THE ANNOUNCER'S ROOM, KOAC

ture of a crystal is always placed higher than the hottest weather likely to occur, the plate is ground so as to vibrate at approximately the required frequency, and then by means of adjusting the temperature the required frequency is maintained. Temperature adjustment is effected in two heat-insulated chambers, each with a thermostat for controlling the temperature within very narrow limits. These chambers are connected with the heater circuit, which is continuously connected with the power supply, regardless of whether or not the transmitter is in operation, since a period of several hours is required for the crystal to attain a constant operating temperature. The temperature control equipment is provided in duplicate, so that in case one crystal fails to oscillate, the other can be instantly thrown into the circuit.

In addition to the crystal oscillator, the unit contains the first and second amplifiers. These are 50-watt power tubes. The oscillator circuit and the first and second amplifier circuits are shielded by individual copper boxes to prevent radio frequency feed-back into the crystal and amplifier circuits. Installed with the amplifier tubes is a 250-watt modulator tube, the effect of which is to increase the percentage of modulation, which has thus been raised to upwards of eighty per cent of the normal antenna current, a great advantage in reproducing the human voice.

A power amplifier with a five-kilowatt water-cooled tube furnishes one-kilowatt power output. By working this tube at only 20 per cent of normal, much more stable operation is obtained. This feature is noticeable in all the stages. The oscillator and first and second amplifier tubes are all worked much below normal rating.

The entire power supply for both oscillator and amplifier units is obtained from two generator units, the larger containing two 2,000-volt direct-current generators, the smaller, one 24-volt and one 25-volt generator.

Two large electrolytic condensers and a large iron core inductance are connected in the filament circuit to filter out the commutator ripple. The plate current supply is likewise filtered with condensers and choke coils. Many small filters of lesser importance are found throughout the oscillator and amplifier circuits.

The 50-Watt Speech Amplifier

In addition to the tubes already mentioned in the amplifier unit, is the 50-watt speech amplifier. This tube receives the audio-frequency input from the speech input equipment. Through its indicators it denotes the energy of the signals coming from the studio microphones. Thus the operator can at all times know the energy level of amplification.

An 8-B speech input amplifier receives its input from the studio microphone. Its output works into the 50-watt speech amplifier tube mentioned above. An 18-B amplifier panel is used to operate monitoring loud speakers. This amplifier may receive its input either from the radio-frequency output of the transmitter or from the audio-frequency output of the speech input equipment. This is done by means of a transfer key and enables the operator to listen in on the quality of the input as well as that of the output of the station.

A signal and control panel and also an extension panel are other features of the speech input units. These allow rapid changes of input from two different studios, the announcer's room, and remote control locations such as the Gymnasium, the Band Hall and the downtown theater, as well as telephone communications at all times between the operator and announcer.

Two condenser microphones have been installed. The switches and relays for the condenser microphones are mounted on the top panels of the speech input units. The condenser microphone gives the most faithful reproduction of all frequencies that has yet been attained, and at the same time gets rid of microphone hiss so noticeable with carbon button microphones. This insures clearness and naturalness of reception.

The speech input equipment is completed by a mixing panel placed in the announcer's room. This instrument permits the announcer to use any one of three microphones at will, without signaling the operator. It also permits using two microphones at once. By this means a background of music can be used while the announcer is speaking. Conversely, the speaker's voice may be faded out and the music gradually increased to full volume.

A TYPICAL CONVENTION AUDIENCE IN THE MAIN STUDIO OF KOAC, MR. KADDERLY ANNOUNCING

Protective Safety Measures

Adequate protective measures have been taken to insure the safety of the operator and that of the delicate apparatus subjected to 4,000 volts. All doors on the oscillator and amplifier panels have switches which automatically close down the motor generators if any door is opened. The set cannot be started again until all doors are closed. The one-kilowatt water-cooled tube is protected by an overload relay in its plate circuit, and also by a relay which stops the motor-generators if the water-supply to this tube falls too low. This latter relay is operated by an ingenious application of the venturi tube principle.

An auxiliary water-supply is a part of the installation. This consists of a rotary water pump, a supply tank, and a radiator. In case the city water is shut off, the auxiliary supply can be connected in less than a minute.

The Aerial and Ground Systems

In order to radiate energy freely and effectively from the transmitter, a high antenna has been provided and also a good ground connection. The antenna, of silicon bronze wire, is about 120 feet high and is supported by two towers, one in the center of the roof of the Engineering Laboratory, the other in the center of the roof of the Mines Building. The lead-in is a six-wire cage about 2.5 inches in diameter and 95 feet long. This lead-in passes through the wall of the Physics Building to the operating-room and is supported by two pyrex bowl insulators bolted one on each side of the wall. For ground connection a copper strip four inches wide and one thirty-second of an inch thick was buried one foot deep, parallel to the center line of the antenna. Number 10 copper wires 50 feet long were buried at right angles to the copper strip. These were placed every two feet and their centers soldered to the copper strip. This constitutes the underground system. Another four-inch copper strip leads from the center of the ground system to the operating-room, where all metal framework of panels and motor generators, as well as all conduits, is soldered to this ground strip. The metal towers were also connected to the ground system by copper strips two inches wide.

The State College Programs

A word about the programs. The basis of their selection is, first, that the college occupies a distinctive field and should not attempt to duplicate the types of broadcasts from the already established commercial stations with their programs that are about 90 per cent musical; and, second, that to KOAC broadcasts should be applied the question, "Do they serve the listener; do they aid

him in his everyday or seasonal interests or problems; do they contribute something of value in a cultural or esthetic sense?" All material submitted or available is subjected to these essential tests.

A staff of fifteen people, including student announcers and part-time department leaders, handles the routine work of the daily programs, which are prepared and presented by many different members of the faculty under the supervision of the program director. Agriculture, in nearly all its phases, home economics, engineering, forestry, economics, health, business, 4-H Club work, rural architecture, sports, etc., are elements of the programs. Music and drama are provided occasionally by students of the college.

Aims for High Type of Program

"Experience of two years," says Mr. Kadderly, "confirms the declaration of Professor R. E. Rogers, of the Massachusetts Institute of Technology, that 'radio stations will have to realize there is a large potential public . . . that will not be satisfied with entertainment all the time, with music, or jazz or comedy skits, but that will furnish eager and steady audience for the intelligent diffusion of ideas and culture and, in the largest sense of the word, of education.' Add to that the strictly service features that are fittingly included in programs from an institution that emphasizes the applied arts and sciences, and we have the aim of the program director at KOAC."

Suitable Radio Equipment for Schools

BY J. L. CLIFTON

Director of Education, State of Ohio

THE most suitable type of radio receiving set for one-room schools where current is available, is the all-electric, single unit set. It should be compact, beautiful, and strongly constructed, and have a durable finish that will not become scratched or marred by classroom use, or by moving from room to room. Having a built-in speaker, single dial control, and no exposed delicate parts, it should be designed to give reliable service every day in the school year. A lock would be a very desirable addition to a school set. It would discourage tampering by curious little experimenters, as well as stealing of parts, an occurrence which at present is very annoying in some isolated school buildings. Absolute simplicity and reliability of operation are essential.

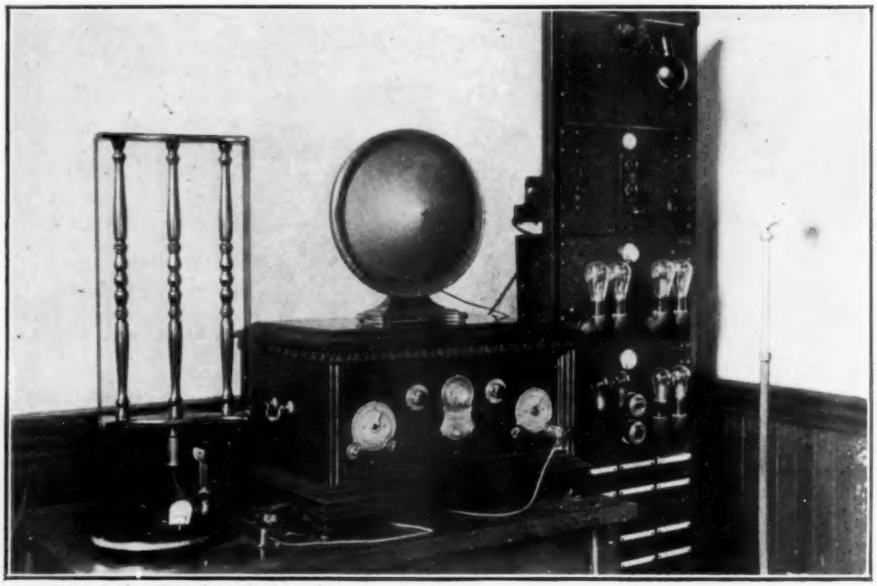
With the rapid advancement in the radio field, and nearly a hundred possible sets to select from, the teacher should not allow himself to be caught by the too rosy, ringing recommendations of the salesman, but should trust more to the exact opinion of the expert advisor, and, especially, test

Courtesy of the Majestic Radio, Chicago

PUPILS OF THE ST. LAWRENCE SCHOOL, CINCINNATI, OHIO, LISTENING TO A PROGRAM OF THE AMERICAN SCHOOL OF THE AIR

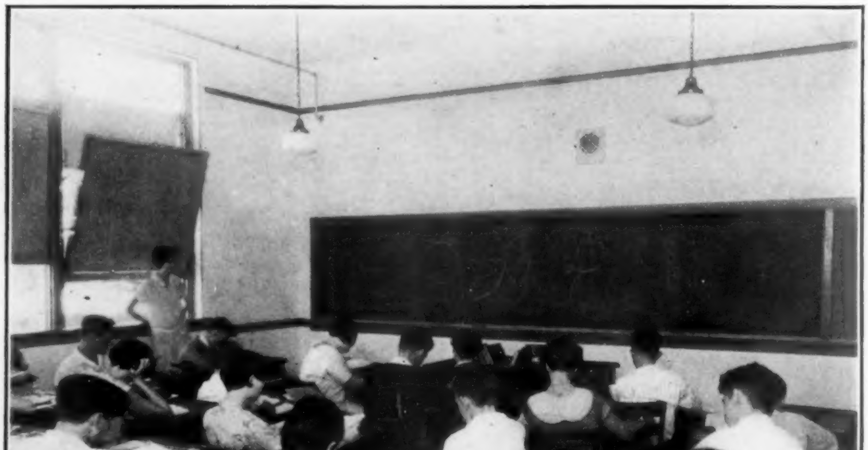
for himself the relative merits of the various sets being considered.

Is there sufficient volume of sound to insure that distant stations may be heard distinctly? Does the volume remain uniform or does it become too loud sometimes, and at other times fade away? The tone quality should be natural throughout the entire musical and voice range of the scale, from the lowest-frequency tones, such as the organ, 'cello, or bass voice, to the high-frequency tones, such as the violin, or soprano voice. If a set is highly selective, it will be possible to secure the programs of a large number of stations from one end of the band to the other. Each station should be distinct, and come in clearly without interference from high-powered



Courtesy of the Stromberg-Carlson Co.

WELL-INSTALLED EQUIPMENT IN THE OFFICE OF THE JOHN SIMPSON JUNIOR HIGH SCHOOL, MANSFIELD, OHIO



Courtesy of the Radio Corporation of America

A CENTRALIZED RADIO IN THE VALLEY STREAM HIGH SCHOOL, VALLEY STREAM, N. Y.

stations that are near on the dial. Some sets are highly selective at certain spans on the dial, but are not at others.

Regarding the cost of receiving sets, a compromise must be reached between maximum service and minimum cost. Cheap equipment is often very expensive, and gives poor results besides. It is particularly desirable to consider the maintenance of the set over a period of years. If suitable sets are obtained, there is very little to get out of order or need replacing, with the exception of tubes at long intervals.*

The Radio Score Card

The Radio Score Card given below has been prepared to assist teachers and school officials in the selection of suitable radio receiving sets for school purposes. The radios should be tried out in the place where they are to be used. Two sets can be compared at a time. Have both sets equipped with new tubes, and wire them up through the switching system so that antenna and grounds may be instantly changed from one set to another.†

* George E. Cole: "Equipping the School with Radio."—*The Nation's Schools*, Vol. II, No. 4, October, 1928, pp. 53-6.

† Harry Alter: "Judging the Merits of a New Set."—*Radio Broadcasting*, June, 1929, pp. 81-83.

RADIO SCORE CARD

Tested by.................................Date.........
Name of Set 1...........................Model........
Name of Set 2...........................Model........
Name of Set 3...........................Model........
Name of Set 4...........................Model........

Rate the sets being compared by marking
A—Excellent, B—Good, C—Fair, and D—Poor.

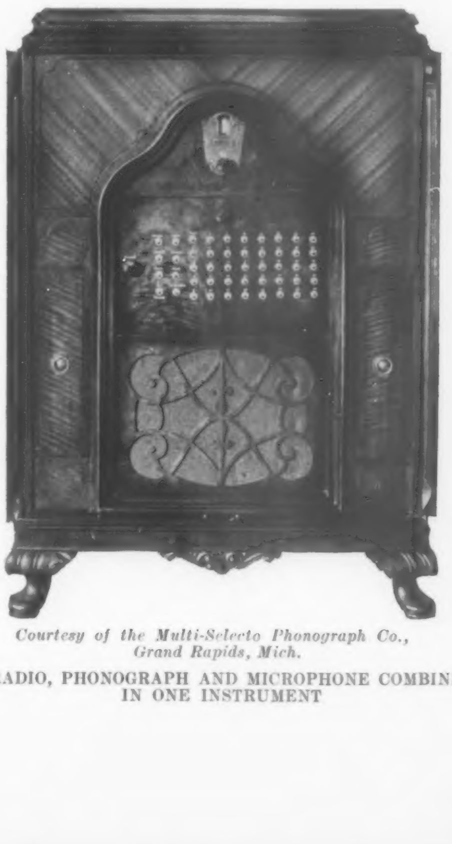
Items Set No.	1	2	3	4
I. Construction				
1. *Appearance:* Beauty, compactness, built-in speaker				
2. *Sturdiness:* Strong construction, simplicity, no exposed delicate parts, durable finish				
II. Operation				
1. *Simplicity:* Easy to operate				
2. *Reliability:* Can be depended upon..				
3. *Minimum of care* and servicing necessary				
III. Sensitivity				
1. Volume of distant stations adequate. Test stations throughout the dial range				
2. Compare especially the volume of stations from which most of the broadcasts are to be received.......				
3. Even flow of current, not varying from too loud to too low, or fading.				
IV. Tone Quality				
1. Low frequencies (organ, 'cello, etc.).				
2. Compare at high frequencies (violin, soprano)				
3. Spoken words, distinct, clear, natural				
V. Selectivity				
1. Dial range covered by nearest high-powered station. (Determine by number of dial marks.)................				
2. Observe nearest channel to high-power local station that a distant station can be heard...............				
3. Selectivity at high-frequency end of band, at middle, and low-frequency end of band				
VI. Cost of Set Installed.................				
Composite rating of each set........				

Equipment for a One-Room School

Any good radio set intended for the home will be satisfactory for use in a one-room school. If screen grid tubes are used, a dynamic or power-driven loud speaker is best suited because of its ability to deliver greater volume with greater fidelity in reproduction. A radio set that would rank high on the Score Card should be selected. If electricity is available, an all-electric set should be selected because it is always ready at the snap of a switch, it costs less to operate, and greater volume and more realistic tone is secured. If electricity is not available, a simple, sturdy, up-to-date battery set should be selected.

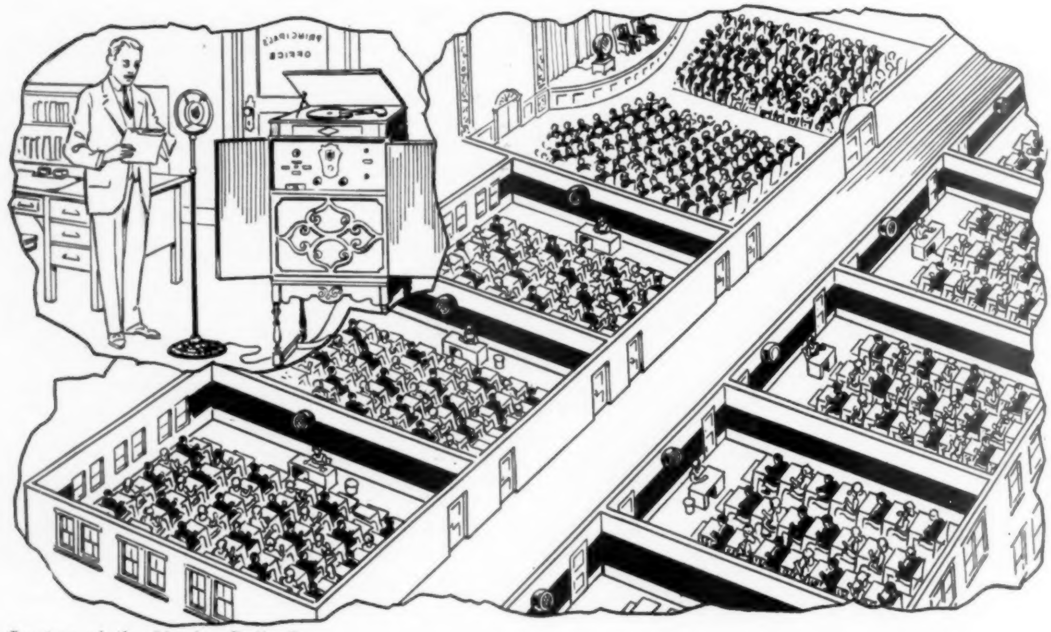
Equipment for Small Schools

For a school building of from two to ten rooms, or even more, a regular receiving set with or without a power amplifier and a switchboard may be used. Sometimes a single portable radio set is moved from room to room as it is needed. It is usually more satisfactory, however, to place a loud speaker in each classroom and use a simple switch system to change the program from room to room, or all the rooms may receive the broadcasts at the same time. Some sets have sufficient power so that ten or more speakers may be operated at a time without seriously interfering with good reception. While equipment of this kind may render all the types of service that the central set can render, there are many more possibilities of its getting out of order, especially if expert advice has not been followed in selecting and installing the equipment.



Courtesy of the Multi-Selecto Phonograph Co., Grand Rapids, Mich.

A RADIO, PHONOGRAPH AND MICROPHONE COMBINED IN ONE INSTRUMENT



Courtesy of the Simplex Radio Co.

ANNOUNCEMENTS AND LECTURES MAY BE MADE THROUGH MICROPHONE TO ENTIRE STUDENT BODY

Equipment for Larger Schools

A centralized set combining radio, phonograph, and microphone is very flexible and may be used in many ways to facilitate school work. Besides the radio lessons regularly used as a part of the class instruction by means of the loud speakers installed in each classroom throughout the school, phonograph selections and the microphone input can be reproduced instantly in any or all rooms in the building. The microphone becomes a very valuable time-saver for making announcements to the entire school or to any grade or class. In the past the principal was obliged to go or send from room to room, or to assemble the students, in order to make the announcement.

The microphone may be used to broadcast spelling bees, or other contests. Honor rolls and good deeds may be mentioned, and choice papers prepared by pupils read to any grade or to the entire school. What could be more appropriate on a hot spring afternoon than to have short, snappy setting-up exercises directed from the office? By means of the pick-up, phonographic selections may be used in any classroom work, to enrich a home-room program, as classes change or at dismissal, in the gymnasium for physical exercises, or rhythmic games.

If the different schools of the system are hooked up through a central system, announcement may be made by the superintendent, supervisor, or other person, to any school, or all the schools, or any grade in all the schools. The range of possible uses may extend from a demonstration lesson by a supervisor, or a standard arithmetic test for all the sixth grade pupils in the system, to an important announcement, fire drill, assembly, or an entertainment feature for all the pupils.

Superintendent F. J. Prout of Sandusky, a real pioneer in centralized radio for schools, says, "There is no other factor which has the utility and tends toward the unity of the school as does this radio equipment."

The centralized equipment is usually installed in the principal's office, and the switchboard provides individual control over each loud speaker in the building. There is usually an attachment for the microphone in the auditorium. Care should be exercised in the installation of the aerial to see that it does not extend over or near a high-tension line, and that it is properly grounded, so that it will not conduct lightning into the school building. Care should also be exercised in the selection and placement of loud speakers, since they are important in the faithful reproduction of tones. If installed when the building is constructed, the most approved method uses special loud speakers built for mounting flush in the wall. The appearance is improved—there is no possibility of roughly handling the speaker, and the quality of reproduction is improved by virtue of the wall itself acting as a baffle. As a rule, pupils listen better when the loud speaker is placed in front of the room about on a level with their heads. Echo effects are to be avoided. There should be a volume control in each room. Mass auditorium reception has not proved very satisfactory for radio lessons intended for class reception.

Those who are interested in equipping schools for radio reception should get in touch with their local dealers, as several of the larger radio manufacturing companies have given considerable attention to suitable school equipment.

Better Illumination and Electrification for School Buildings by the Adoption of Standards

BY CARL F. WOLF

ILLUMINATING AND ELECTRICAL ENGINEER, VALLEY ELECTRICAL SUPPLY COMPANY, MERCHANDISING DIVISION OF THE SAN JOAQUIN LIGHT & POWER CORPORATION, FRESNO, CALIF.

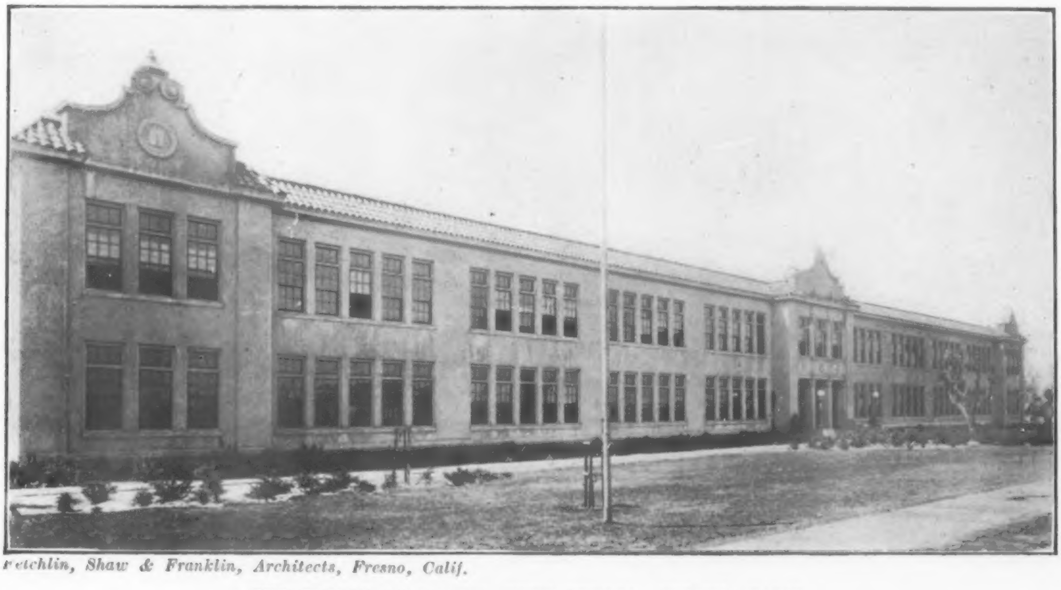
FRESNO, CALIF., voted $1,800,000 in school bonds to cover mostly new school structures and some remodeling," was a very interesting bit of news, but the story of what those dollars have purchased for the community is a genuine revelation.

The foresight of William John Cooper, then Superintendent of the Fresno city schools, now Commissioner of Education, Washington, D. C., caused the formation of a standardization committee, composed of architects, engineers and representatives of building construction, which was instructed to establish standards governing the construction of all schools coming under the abovementioned program, scrutinizing their plans and specifications, and testing materials entering into their construction. Standards were drawn for every phase of building construction, such as masonry, carpentry, plumbing and electrification.

The attitude of the electrical engineer toward electrical installation in connection with schools is often that of a technician dealing with forces and apparatus which nobody else, and particularly school boards, cares anything about, and the boards usually proceed from the engineer's viewpoint, rather than from that of the user. This article, we hope, will serve as a synopsis of the method pursued by the author, attached to the above committee as consulting illumination and electrical engineer, in selling to that school board, and others since that time, the Standard of Illumination recommended by the "Code or Lighting for School Buildings," as prepared by the Illuminating Engineering Society, and the American Institute of Architects and approved as the American Standard, June 16, 1924.

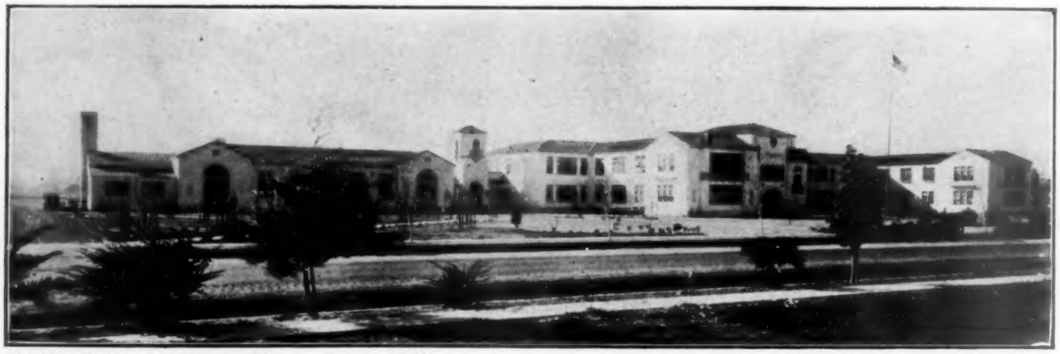
Explaining the Standard

The first essential, according to this plan of selling advance lighting, is the adoption of the illumination standard, whatever the source, safeguarding the eyes of those using the school building. The means to provide for that illumination follows as a natural consequence of the establishment of lighting standards. The following statement from a "Standard of Lighting for School Buildings," city of Fresno, sets forth that principle:



Fetchlin, Shaw & Franklin, Architects, Fresno, Calif.

THE EDISON TECHNICAL HIGH SCHOOL, FRESNO, CALIF.
The first school completed under "Fresno Standards"



Shields, Fisher & Lake, Architects, Fresno, Calif.

THE ROOSEVELT HIGH SCHOOL, FRESNO, CALIF.
The second school completed under these specifications

In contradistinction to *lighting*, good or bad, I define *illumination*, good or bad, as a scheme of lighting which not only takes into consideration the intensity of the source, and its kind, but also such factors as location of source, variableness of intensity, color, shading and adaptation to surrounding design and color motives, making possible the partial or full expression of the emotional value of light.

(NOTE.—We have omitted mobility and portability of light, as these elements find relatively small use in school work; possible exceptions being "mobile blending" of stage and auditorium cove lighting and portable stage equipment.)

Or, in other words, *light* may be spoken of as the cause, and *illumination* as the effect.

In devising a standard of illumination for school buildings, we are primarily concerned in the matter of creating artificial illumination which will supplement daylight illumination at the early and late hours of the day, and at periods when the sky is overcast.

It is important that provision for adequate, artificial illumination be made whether the schools are used at night or not. To plan for this artificial illumination thus becomes a matter of studying:

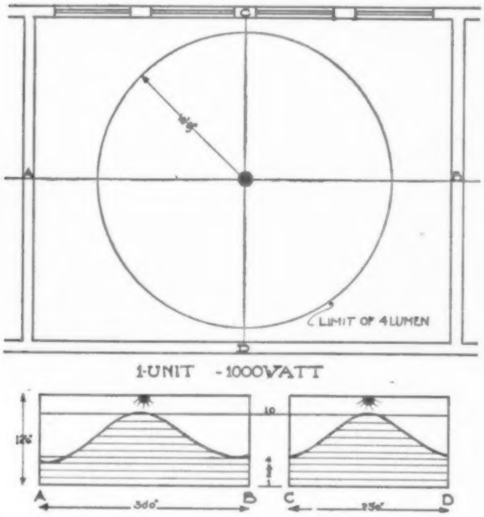
First, the illumination desired and demanded.

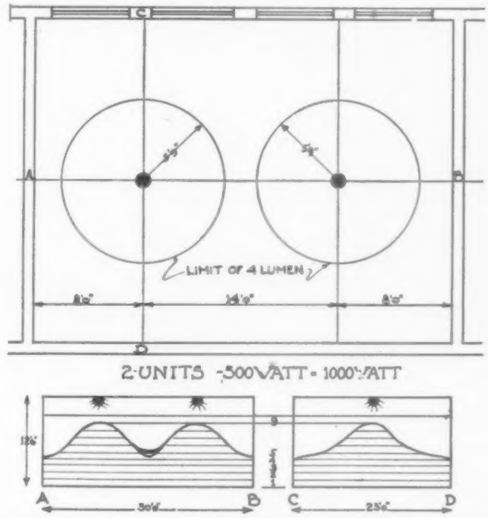
Second, the electrical engineering necessary to wire for such illumination.

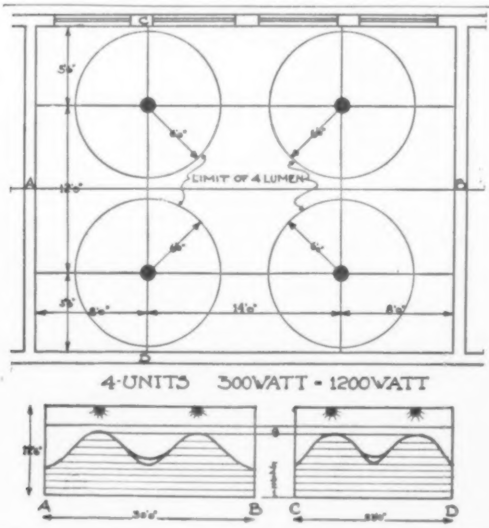
Third, the proper choice of luminaires or lighting units and specifications covering same.

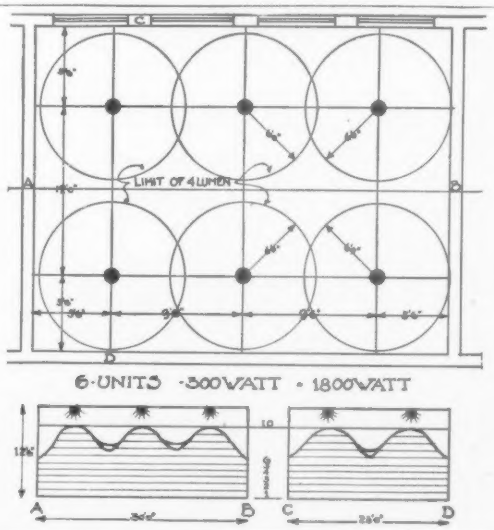
A Study of the Illumination Desired.—After the individual needs of the various rooms, etc., of a school in respect to illumination have been studied, a specification or a standard may be designed which shall cover the various factors entering into proper illumination, such as the intensity necessary to furnish the proper amount of light, the location of the source or sources of light within the room or rooms, the type of luminaire, the color values of the light, the sizes of the lamps and the shading and adaptation to surrounding design, and the color motives of the respective rooms to be illuminated.

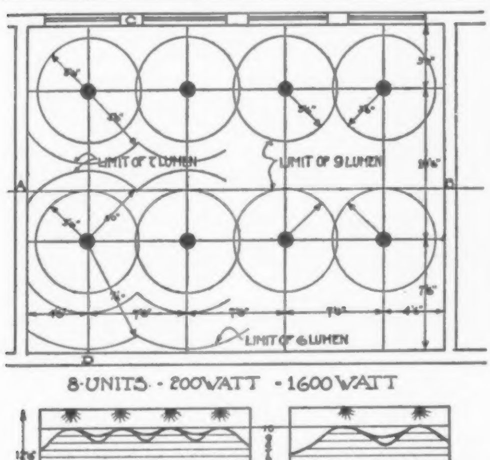
EDISON TECHNICAL HIGH SCHOOL
A large classroom used for drawing-classes, which employs lighting equipment equivalent to that of two standard classrooms











CHARTS USED TO SELL TO SCHOOL BOARDS THE HIGH STANDARD OF ILLUMINATION

The top of each chart shows a typical classroom of 30 x 23 feet in plan, and minimum limits of 4 lumens per square foot. The lower portions of the charts indicate longitudinal and transverse cross-sections with the "heaps" of lumens showing the most even "depth" of illumination. The most even distribution could be attained only by the use of eight units, whose combined wattage is not much greater than that of the four-unit plan

Electrical Engineering.—The electrical engineering practice and the specifications covering same actually become a matter of individual study and preparation of suitable plans and specifications for each school, so we have attempted to set down a few general facts and recommendations in the following paragraphs. It is further recommended that the architects be instructed to engage the services of an electrical and illuminating engineer to prepare suitable plans and specifications in harmony with the standards outlined herein.

Standard of Illumination.—The illumination required for school buildings is attained:

First, by the use of natural light when in use during daylight hours. The disposition and size of windows to attain the standard of illumination outlined in the latter paragraph is a matter to be carried out through the respective branches of construction involved.

Second, when school is in use during periods when natural light fails or is absent, the various rooms which may be occupied by teachers or pupils shall be provided with artificial light sources to give an illumination in accordance with the rules laid down by the Code of Lighting for School Buildings as prepared by the Illuminating Engineering Society and the American Institute of Architects and approved as the American Standard, June 16, 1924, and attached hereto as reference.

Ernest J. Kump Co., Fresno, Architects

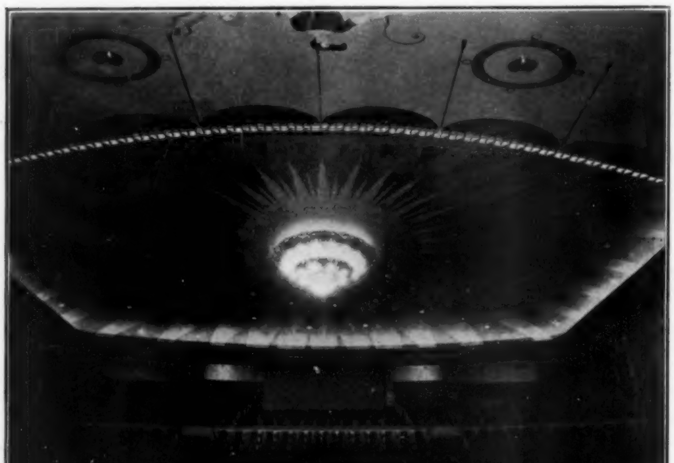
AUDITORIUM, WASCO UNION HIGH SCHOOL, WASCO, CALIF.
Illuminated and electrified to Fresno School Standards

The text then quotes the code of lighting before detailing anything of the wiring requirements, taking up in logical sequence the subjects: illumination required; minimum values of illumination required and values recommended for artificial lighting; avoidance of glare; distribution of artificial light; color and finish of interior; exit and emergency lighting; luminous flux emitted from lamps, etc.

To demonstrate the principle of correct illumination, particularly the element of distribution and relative intensity, I submitted the charts appended to this article. Assuming the choice of approximately 10 lumens per square foot in a typical classroom, we could attain for a limited area such intensity by the use of a 1,000-watt lamp for an equal lumen capacity to an arrangement divided up among two, four, six and finally eight units, correctly spaced and mounted.

In explaining these charts to the committee, we likened light to sand. For an infinitesimal fraction of a second, let us say, globules of light are emitted from the unit even as sand globules might be poured from a hole into the room from that point. The resulting distribution of the globules from one unit in the center of the room would be very much like that in the first drawing. A "depth" of 4 lumens, the recommended *minimum* of the lighting code, would be limited to a circle of 10-foot radius, and the little boy or girl in the corner of the room would have insufficient light, whereas those children in the center of the room would have much more than their share.

The even distribution of globules in the last drawing, that with eight units of 200 watts each, convinced the committee and was instrumental in the establishment of a standard for Fresno schools based upon eight units per room of typical size. Another interesting feature of the standard established is that the parallel rows of units are placed relatively close to the windows so that as nearly as possible artificial lighting will come from the same direction (over the left shoulder) as the natural daylight from



WASCO UNION HIGH SCHOOL AUDITORIUM
Showing mobile-blending cove lighting and semi-indirect ceiling unit, with three of five special curtain spots in face of balcony, and the two 500-watt orchestra rehearsal spots in ceiling

which the seating arrangement of the classrooms is determined.

Advantages of the Eight-Unit Plan

The eight-unit plan for a 23 x 30 x 12½-foot room is designed to deliver an intensity of 10 lumens per square foot, or a wattage of 2.2 per square foot. This is equivalent to approximately 10 lumens per square foot on a working plane 2 feet above the floor line, providing the ceiling has a reflecting coefficient of 70 per cent and the walls of 50 per cent, and provided a highly efficient enclosed glass luminaire or lighting unit is selected and installed. The arrangement will give, we stated in "A Standard of Lighting for School Buildings":

(a) The most uniform and generally efficient intensity at the working plane by avoiding excessive variation in illumination upon the working plane.

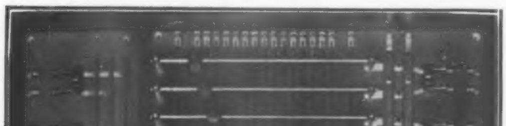
(b) It will give the major portion of light over the left shoulder corresponding to the scheme of natural illumination by windows placed at the left-hand side of the pupil. The eyes of pupil and teacher, therefore, are not called upon to make a readjustment by the transition from daylight to artificial light.

(c) It will overcome glare generally found with the use of a single or a few high-intensity efficient units installed at the ceiling height of the classroom chosen, by directing the total intensity demanded from several sources of light of lower intensity using the same type of luminaire.

(d) The above arrangement will do away with excessively dark shadows, usually the direct result of the use of high-intensity units, by the distribution of the total intensity demanded through several sources of light of lower intensity.

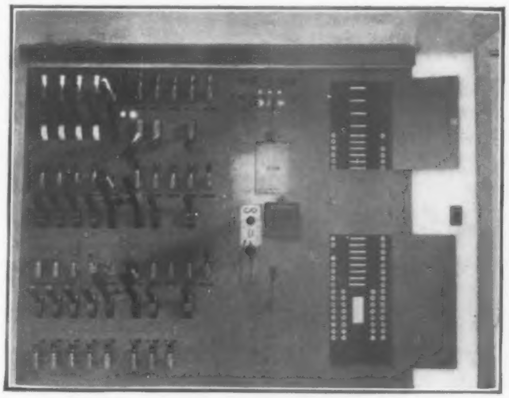
(e) It will overcome reflective glare at the working plane for the same reason as outlined under (c) and (d).

(f) It will provide for uniform illumination of the blackboards and overcome dangerous reflection from them.



SPECIAL 10-TABLE PHYSICS LABORATORY A. C. AND D. C. DISTRIBUTING PANEL

This gives variable D. C. voltage to any one or all tables. It was built according to the author's ideas and design



STAGE BOARD WITH BUILT-IN DIMMER EQUIPMENT, WASCO UNION HIGH SCHOOL AUDITORIUM

Another interesting and far-sighted recommendation is that if there is any likelihood of conversion of office rooms into class or study rooms at some later time, the grouping and placing of outlets should be in harmony with the recommendations for classrooms. Where two switches are used in classrooms, they are so arranged as to make possible the use of one-half the classroom for small classes without illuminating the rear portion of the room.

Classrooms are to be wired to provide 10 lumens per square foot. Art and sewing rooms to have 10 to 15 lumens per square foot. Classrooms to have efficient enclosed type units. Study halls, libraries, art and sewing-rooms, as well as kindergarten rooms, to have total indirect units, preferably wired for on the basis of 3 watts per square foot; hall and corridor lighting to be accomplished by alternately wired units, and preferably equipped, in addition, with watchman outlets placed at corridor and stair hall intersections, as well as over fire-hose racks. These watchman outlets, usually 50-watt outlets, placed eight feet from floor, provide ample illumination for the usual watchman's trips of inspection through the building. Switches controlling hall lighting to prevent tampering with them, are key switches and are mounted 6 feet from floor.

The Wiring Standards

Following the recommended lighting standards are listed the wiring standards proposed to supply the means by which to make possible the previous recommendations and also to give adequate electrical service to the building. These specifications begin with the service run underground from the power company pole to an ample switchboard room or transformer vault, as in the case

of all high school groups. In all cases it is specified that switchboards, feeders, etc., shall be sufficient for immediate and for all contemplated future demands which may be made upon them. A vault for battery emergency lighting equipment is also provided. Convenience outlets are enumerated, and in each case the use to which they may be put is described as complete justification for their inclusion.

These convenience outlets are limited to four receptacles per circuit in offices or similar rooms. Those in classrooms are served by individual circuits and are placed double, giving one plug at the teacher's position for lamps or experimental apparatus, and one plug at rear of classroom for use of stereopticon machine, etc. All boys' and girls' toilets are to be wired for electric air towel equipment of capacity equal to one "towel" per four washbasins. In addition to convenience outlets for lighting, we have recommended and adopted in our standard the use of 5-kilowatt heavy-duty receptacles for all offices, teachers' rest rooms, kindergarten rooms, parent-teacher rooms, Boy Scout rooms; and at least one classroom of each school is equipped with four of these heavy-duty receptacles, to allow for auxiliary heat with electricity after regular school hours, when the regular school heating plant is not in operation.

Lighting Auditoriums, Gymnasiums, Shops, Laboratories

The standards also contain special recommendations for the lighting of auditoriums and their stages, as well as shop buildings and gymnasiums. Physics, chemistry and biological laboratories come in for their share of recommended special illumination and electrification; for example, all laboratory tables are served from special distribution panels, both A. C. as well as D. C. current. D. C. current may be distributed directly from generator, or through banks of batteries, allowing, in the latter case, voltage variation equal to potential difference between first and last battery.

The above recommendations make it incumbent upon the architect at least to prepare the feeders and branch wiring circuits for such specialties, leaving it to the school board to purchase the equipment at a later date. The same holds true with special equipment for the stage. The only thing required for immediate installation is the stage board, the built-in footlight, and the wiring for borders and various stage pockets. The footlight recommended is never to be less than 66 per cent of the proscenium opening, and is computed on the basis of a multiple of 3 feet plus 2 feet, as footlights and borders are of the large lamp type, using locked-in removable color screens; each footlight to contain three color circuits and one plug circuit for spots, which may be placed into the two or three one-foot spaces allowed in the footlight trough. The use of straight footlights in connection with a straight forestage is recommended as a means of saving in construction.

All school auditoriums with fixed seating arrangement are to be wired for and equipped with aisle lights, not over four rows apart on opposite sides of aisles, with an occasional convenience outlet wired in through the same conduit system for the use of vacuum sweepers.

In addition to the usual duplex convenience outlets in the orchestra pit or auditorium floor reserved for orchestra, we recommended the installation of two or more special light or projector outlets in the ceiling overhead on separate control from general illumination in the auditorium. For rehearsals, rather than have students use music-stands equipped with portable lamps plugged into convenience outlets provided, leaving them to be kicked around and damaged, these special lighting units, separate or incorporated into the regular ceiling fixtures, will give sufficient light for music rehearsals. It is recommended that all schools be at least wired for ample yard lighting to allow for the use of school yards as playgrounds at night time, and the more monumental buildings, wherever they are located on prominent thoroughfares, are recommended to be wired for floodlighting equipment.

Planning for Long Service

The wiring facilities called for, as well as schedules for feeders and services, anticipate considerable growth in the science of illumination, and the additional cost of such installation, though hardly more than one or two per cent of the cost of the whole structure, is more than justified when we consider that these buildings are all planned for twenty-five to fifty years of service. We anticipate that it will not be more than a few years hence when the present tungsten luminaires will be replaced by "sunlight lamps," now in process of development and undergoing physiological and psychological experimentation. Dr. M. Luckeish speaks of this Tungsten-Mercury-Arc light as the first practical source for simulating sunlight which has been developed with a possible new era of lighting in mind.

The influence of the Standards is not limited to Fresno. Schools in other parts of the country are being built to the same electrical plans and specifications, as the illustrations accompanying this article show. In functioning as an advisor or consultant to a school board, the electrical industry must, first, have a keen appreciation of the problems of education; and, second, must be able to sell the solution it has to offer, not as an engineering problem, primarily, but as a problem of education.

Costs of Nine New School Buildings in Newton

BY CECIL C. CHADWICK

Public Buildings Commissioner, Newton, Mass.

During the past ten years, nine new school buildings have been erected to take care of the rapid growth of the city of Newton. Six of these were elementary buildings, two junior high school buildings, and one an administrative unit in the high school group.

Newton is a high-type residential city. This means that buildings must be not only well placed as to locality, but also of a type and design which harmonize with surrounding buildings. The latter consideration often results in higher unit costs than are common in the average city or town. In order to meet the demand for high-type buildings and yet build as economically as possible, very careful attention has been given to the design of buildings for maximum utilization as well as to the type of construction and the use of the materials that would be most lasting and that would result in lowest costs for future maintenance.

We believe that past experience offers the best guide to a city for future construction. To this end, very careful records have been made of all these buildings as to description, specification, unit costs, and the proportional costs allotted to the various trades which had a part in their construction. The trade costs have been determined from actual contract costs, as the city has adopted a policy of contracting with each separate trade rather than handling the work through a general contractor. We have found this practice to be more satisfactory from an administrative point of view and more economical in that it results in the saving of the contractor's profit on each of the special items.

The accompanying tables show the total costs of these nine buildings with certain unit costs indicated.

As an example of the type of construction of these nine buildings, the following description of the Administration Building is offered. This is an administration building for a group of high school buildings and, besides the administrative unit proper, contains a cafeteria, a gymnasium, an auditorium, a health unit and seventeen classrooms.

The exterior walls of this building are of buff brick backed with common brick. The trim is of cast stone, and the steps are of granite.

The basement partitions and the lining of the outside basement walls are of salt-glazed brick to dado height. Above, they are of selected sand-struck brick. Sand-struck brick were also used for the interior lining of the gymnasium walls. All interior walls surrounding corridors or stair-

SCHOOL-BUILDING COST DATA, NEWTON, MASSACHUSETTS

Name of School	Year Built	Use	Type	Total Cost	Cost per Classroom	Cost per Pupil	Cost per Cubic Foot
A. E. Angier	1920–21	Elem.	A	$281,575.08	20,115	575.00	43.8¢
Frank A. Day	1921–22	Jr. H.	C	325,586.52	19,152	547.00	37.2
Davis	1922–23	Elem.	C	210,820.05	15,060	430.00	46.2
Underwood	1923–24	Elem.	E	294,286.43	16,350	482.00	49.6
Administration Building	1925–26	High	B	941,387.19	.....	.....	46.6
Levi F. Warren	1926–27	Jr. H.	C	565,140.60	24,570	665.00	43.0
John Ward	1927–28	Elem.	B	254,028.60	19,540	588.00	48.2
Hamilton	1927–28	Elem.	D	143,762.25	17,980	514.00	37.7
Cabot	1928–29	Elem.	B	194,334.68	13,880	396.00	43.2

PER CENT OF SCHOOL-BUILDING COSTS ALLOTTED TO VARIOUS TRADES

(Including architects' fees and administrative expense)

Name of School	General	Grading	Painting	Heating	Plumbing	Electric	Sheet Metal	Pipe Covering
A. E. Angier	81.6	0.9	Included in general contract	10.2	4.0	3.3	Included in heating contract	
Frank A. Day	72.9	1.8	"	14.1	4.8	6.9	"	"
Davis	75.1	5.1	"	11.0	4.7	4.1	"	"
Underwood	75.1	0.4	2.0	11.8	4.4	4.8	1.5	"
Administration	70.1	4.0	1.5	7.7	3.1	10.7	2.1	0.8
Levi F. Warren	72.9	2.3	2.9	11.6	4.0	3.6	1.9	0.8
John Ward	73.8	3.4	3.2	9.2	4.9	3.1	1.9	0.5
Hamilton	64.5	4.4	2.8	12.5	6.0	5.3	3.3	1.2
Cabot	63.4	6.6	3.6	11.9	6.0	4.6	3.1	0.8
Average per cent	69.97	3.17	2.67	10.78	4.8	5.16	2.47	0.82

cases are of terra cotta tile. Minor partitions above the basement are of metal lath and hard plaster on wood studding.

Floors, roof and interior partitions are all carried on steel framing with steel or reinforced concrete columns. The floor system is of flat slab construction in the gymnasium and auditorium, and pan system with plastered ceiling below in the remainder of the building.

All stairs have interlocking steel treads and risers on steel stringers. Treads are filled with granolithic. Balusters are of iron with wood rails.

For floor surfacing, granolithic was used in the basement, auditorium and balcony, in toilet rooms and in stair halls; terrazzo for the main entrance lobby and for the corridor across the front of the buildings; wood floor in gymnasium and on stage; linoleum in classrooms, offices and secondary corridors; and rubber tile in aisles of the auditorium.

The type of construction represented by this building will naturally not be found in buildings of "C" or "D" type, but in general it may be said that the other buildings are built of as high quality of materials and with as advanced design and construction for their types as is the administration building.

EDITORIAL NOTE.—The foregoing statement has been abstracted for THE AMERICAN SCHOOL AND UNIVERSITY by W. B. Featherstone, Graduate Student in Educational Administration, Teachers College, Columbia University, from a more detailed study by Commissioner Chadwick, of Newton, to whom inquiries for additional data should be addressed.

Modern Schools in South America

BY H. ERROL COFFIN

MEMBER OF THE FIRM OF COFFIN & COFFIN, NEW YORK; CONSULTING ARCHITECT TO THE REPUBLIC OF CHILE

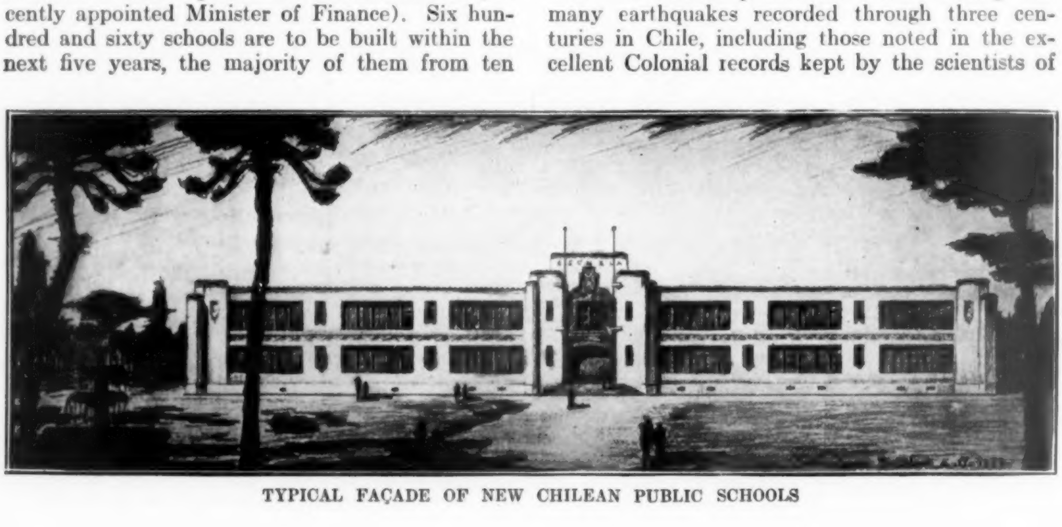
PERU and Chile, for many years disputants about the Tacna and Arica areas, having amicably adjusted their differences, are now fostering general education. This has been an impetus for new public and private schools.

The Lima Girls' High School, to be erected on the Avenida 28 de Julio, is inspired by the Spanish Colonial architecture of Lima—particularly that of the University of San Marco, which was founded a century earlier than our own Harvard University. The irregularity of the site necessitated considerable study to evolve a workable plan. These very difficulties when surmounted resulted in a more interesting building.

The Government of Chile has started a nationwide school-building program under the guidance of the eminent engineer, Senor Rudolfo Jaramilla, Director of the Department of Public Works (recently appointed Minister of Finance). Six hundred and sixty schools are to be built within the next five years, the majority of them from ten standard plans. When those are completed, the authorities will be able to enforce the obligatory attendance laws, thereby decreasing illiteracy. Over $200,000,000 is to be spent in five years on schools, bridges, roads, and other improvements. These improvements are indicative of the new and progressive spirit of Chile during the régime of President Carlos Ibanez.

Chile has a coast line of 2,620 miles and a maximum width of only 284 miles. In both the length and the width of the country there is a great variety of temperature and climate. It must be recalled that there is a rise in altitude of 24,000 feet from Valparaiso on the coast to the summit of Mt. Aconcagua. These physical variations necessitate consideration in evolving standards for the school buildings.

It is a curious phenomenon that during the many earthquakes recorded through three centuries in Chile, including those noted in the excellent Colonial records kept by the scientists of



TYPICAL FAÇADE OF NEW CHILEAN PUBLIC SCHOOLS

GIRLS' HIGH SCHOOL, LIMA, PERU

the monastic orders, the seismic movements have invariably been from the north, southward toward Mt. Aconcagua, or from the south, northward toward this mountain. It seemed advisable, in order to offer greater resistance to the seismic movements, to so place the schools that their long axes would run north and south, thereby facing the buildings principally east and west, which fortunately afforded the best lighting.

One of the interesting aspects of this building program is the evolution of a "Modern Chilean" architecture. Chile, the land of the Araucanian Indians, settled by the Spanish, is indicated in this architecture. The façades, expressive of the plan requirements, are modern, the architectural motifs, such as entrances, are of Spanish Colonial design, while the running ornament is inspired by Araucanian decorations. The ensemble, therefore, is indicative of use and derivation.

A great deal of thought and research was expended to incorporate in these buildings the most modern practices in school planning and construction as adapted to the specific environmental and physical requirements previously mentioned, keeping the buildings truly Chilean. The following is a list of the standards adopted in the developing of the preliminary plans:

I. *Classrooms*

Inasmuch as the classroom is the dominant unit, standards for this were first adopted.

A. **Size and Capacity**

1. The size is 9.75 meters long and 6.70 meters wide, which permits the placement of 8 seats in each 5 rows, with sufficient aisle space.

2. The minimum height from floor to ceiling is 3.658 meters. This height provides proper cubic-air content per pupil and sufficient lighting at the far side of the room.

THE INSTITUTO INGLES, SANTIAGO, CHILE

3. The capacity of 40 pupils has been taken as the maximum which a teacher can effectively handle.

B. **Natural Light**

1. The lighting is unilateral, from the left of the pupil.
2. The clear-glass area of the windows is equal to 20 per cent of the floor space.
3. The mullions or piers between windows do not exceed 30 centimeters in width. By adhering to this, no objectionable shadows are cast across the pupils' desks.
4. From the front wall of the classroom to the first window there is wall space of 1.20 meters to 1.80 meters. Thus the source of light is directly at the left of the pupils. Objectionable blackboard reflections are also reduced.

C. **Coatroom**

The coatroom, 1.40 meters wide, is located at the rear of the classroom.

D. **Blackboards and Display Boards**

Inasmuch as the front wall is the most valuable for blackboard use, the entire space is devoted to blackboards. There are also auxiliary blackboards opposite the windows. Near the door is placed a bulletin board of cork, for notices, and over the blackboards a strip of display board of the same material.

II. *General Plan*

Having arrived at the standard classroom, the next consideration is the proper location of these units.

A. **Orientation**

A primary consideration is orientation. For hygienic purposes, classrooms should receive some sunlight during part of the day. South exposure is disadvantageous as having too little sun; north has so much that the glare is objectionable. Consequently, the classrooms face east or northeast, northwest, west and north as the best order of compass points in orienting them. South light is avoided except for special rooms.

B. **Earthquakes**

Most of the classrooms are placed so that the building may face east; the long axis runs north-south. This coincides with the proper planning to resist seismic movements.

III. *Façade*

A. **Height**

The small schools are of one story, and the larger two. They were planned thus for two reasons; first, it is desirable that the amount of vertical travel be minimized; second, the lower buildings are less costly in earthquake-resisting construction.

B. **Architecture**

The exterior design is truly Chilean, modern in feeling, with motifs inspired by the Spanish Colonial architecture, and ornaments derived from the Araucanian art.

IV. *Interior Arrangement*

A. **Corridors**

In general, the corridors have classrooms only on one side. This arrangement affords light and in most cases allows the patio type of plan. A width of from 2.43 meters to 3.65 meters, dependent upon usage, is adopted.

B. **Stairs**

All two-story buildings have at least two stairways so located that one may be used if the other is shut off by panic, smoke, or fire. The pupil stairs have a dividing wall between flights, which eliminates the hazard of children's falling over the rail and simplifies the construction. There are no winders in the stairs as they are conducive to accidents. The width between rails is not less than 1.12 meters or greater than 1.52 meters.

The stairs are all in two runs of approximately the same length, to make the travel less tiresome. Risers of 0.1524-, and treads, exclusive of nosing, 0.2921-meter, form steps easy for children to climb. There is natural light on each landing. The corners of the landing are splayed for sanitary and safety purposes.

C. **Doors and Exits**

Corridors, doors, stairs, and aisles are arranged to facilitate egress in case of fire or panic. Classroom doors are near the front of the room, for ease of supervision. They are 1 meter wide, so that two rows of children may pass together. The upper panel is glazed with clear glass approximately 0.15- by 0.20-meter, a size which permits supervision of the classroom from the corridor without distracting the attention of the pupils.

D. **Auditorium and Gymnasiums**

These have one or more emergency exits opening directly to the exterior. Exit facilities permit vacating the auditoriums and gymnasiums in two minutes.

E. **Toilets**

These are so located as to be easily supervised and accessible. There is one on each floor, to avoid loss of time in pupil travel. They are arranged to receive ample light and sun.

There is one toilet for each 30 boys, one urinal for each 40 boys, one toilet for each 20 girls, and one lavatory for each 50 pupils. There are separate toilets for the principal, teachers, sanitary service, and gymnasium. Where the schools are coeducational, separate toilet rooms for the girls are provided.

F. **Special Rooms**

Laboratories, home economics department and manual training rooms are separated as much as possible from classrooms. This segregates the noise, vibrations and odors originating in these rooms. Doors are located so that these units may be changed into classrooms if necessary.

G. **Libraries**

The libraries are centrally located in respect to school activities. Where used by the public, the room or rooms are located near a principal entrance or have an individual entrance. This permits of the closing of the rest of the school, thereby saving maintenance.

H. **Gymnasiums**

The gymnasiums are in separate pavilions readily accessible to the playground, the school, and the public. Here the noise is remote from the classrooms, and satisfactory lighting is obtained. In the smaller schools, the gymnasium is used for an auditorium also, and for this reason has a fireproof moving-picture booth.

The playing floor has sufficient floor space for a standard basketball court and a minimum clear height of 5.5 meters. There are accessory locker, shower, and toilet rooms, an office for the instructor and an apartment for the janitor.

The two smallest schools (160-200 pupil capacity) in some localities are to be coeducational. In these, separate shower, locker and toilet rooms are provided for girls.

I. **Auditoriums**

These are on the ground-floor level, accessible from the classrooms. They are readily entered from the street approaches and so located as to serve both community and school needs. The capacity is sufficient to accommodate the school population with a 10 per cent increase.

The stage depth is approximately the width of the proscenium opening. The width of the stage on either side of the proscenium opening is one-half the width of the opening. These sizes permit a stage of adequate depth for backdrops, and space at the side for the flies.

A fireproof, ventilated moving-picture booth is located in each auditorium.

J. **Administrative Offices**

The offices are easy of access from the school and the outside. They are on the ground floor near the main entrance.

K. **Future Additions**

The schools are so planned that future extensions of an additional capacity of 50 per cent may be readily added.

The Instituto Ingles (a private school for boys) in Santiago has purchased a new campus site on the Avenida Macul, and the Santiago College for women has a new site in the Los Leones section of Santiago. Both institutions have had plans prepared and are arranging to build immediately.

Ramps versus Stairways in School-Building Construction

BY F. W. HART

PROFESSOR OF EDUCATION, UNIVERSITY OF CALIFORNIA

NO one who has trailed a "red-cap" running in high for the next "tip," or hoisted a three-year-old, a suit case and an armful of miscellaneous week-end plunder by stairway from the bowels of the earth beneath the Pennsylvania Station in New York City and, within memory span, glided from train landing to street level over the incline planes of the Grand Central, will require elaborate experimental evidence collected under controlled conditions to convince him that ramps are more comfortable means of gaining altitude than stairways. But comfort is not the sole criterion of whether public buildings shall be equipped with ramps or stairways. Problems of relative cost, difficulty of design, time consumed, carrying capacity, convenience, safety and sanitation arise to demand consideration.

Upon these issues there is evident wide disparity of opinion; for technical articles, the general literature, and expressed current impressions abound in conflict and dissension. In this, as in many other problems of schoolhousing, more adequate data are needed before a final and compelling answer can be formulated. In the meantime, the best that we can do is to reckon with such evidence as we have, weigh opinion and encourage further experimentation.

It is therefore the purpose of this article to present the conflicting points of view and to discuss, as impartially as one can with a bias in favor of ramps, the relative merits of the positions held. From the limited literature * extant on the subject and from correspondence and conference, the following arrays of positions for and against ramps have been arranged. The conflict of opinion is clearly evidenced by the fact that in many instances the same factors are listed in support of both sides of the issue.

REASONS OFFERED BY ARCHITECTS WHY RAMPS ARE PREFERABLE TO STAIRWAYS

1. They are safer.
2. They are more easily kept clean.
3. They reduce the cost of janitor service.
4. They give children a sense of security.
5. They are better adapted to those not strong physically.
6. They make it possible for cripples to attend school.
7. They are less noisy than stairways.
8. They cost little, if any, more.
9. They make possible the moving of large pieces of furniture, pianos, etc., from one floor to another with ease and less probability of damage.

* The data used in this article were collected by G. W. Spring and L. P. Farris, graduate students, in a course in Schoolhousing.

ARGUMENTS ADVANCED BY ARCHITECTS AGAINST RAMPS

1. They are too expensive.
2. They are unnecessary.
3. They are difficult to work into a plan.
4. The extra space involved requires extra fuel to heat.
5. More time is required in traveling from floor to floor.
6. Ramps are not practical, necessary slope 1 to 8.

REASONS OFFERED BY SCHOOL ADMINISTRATORS WHY RAMPS ARE PREFERABLE TO STAIRWAYS

The principals of twelve large high schools in which ramps, or ramps and stairways, are installed were asked to state their preference and give their reasons for the preference stated. All preferred ramps.

1. Ramps afford economy in time of pupils.
2. They are less noisy.
3. They are safer.
4. They are better for the health of adolescent girls.
5. They make it possible to move easily pianos, etc., from floor to floor.
6. They are less likely to cause congestion in time of fire.
7. They are more sanitary, and cost less for janitor work.
8. Fire drills are made in better time on ramps.

In the following paragraphs some of the more pertinent arguments are quoted directly and attempts are made to resolve as many of the issues as possible with the data in hand.

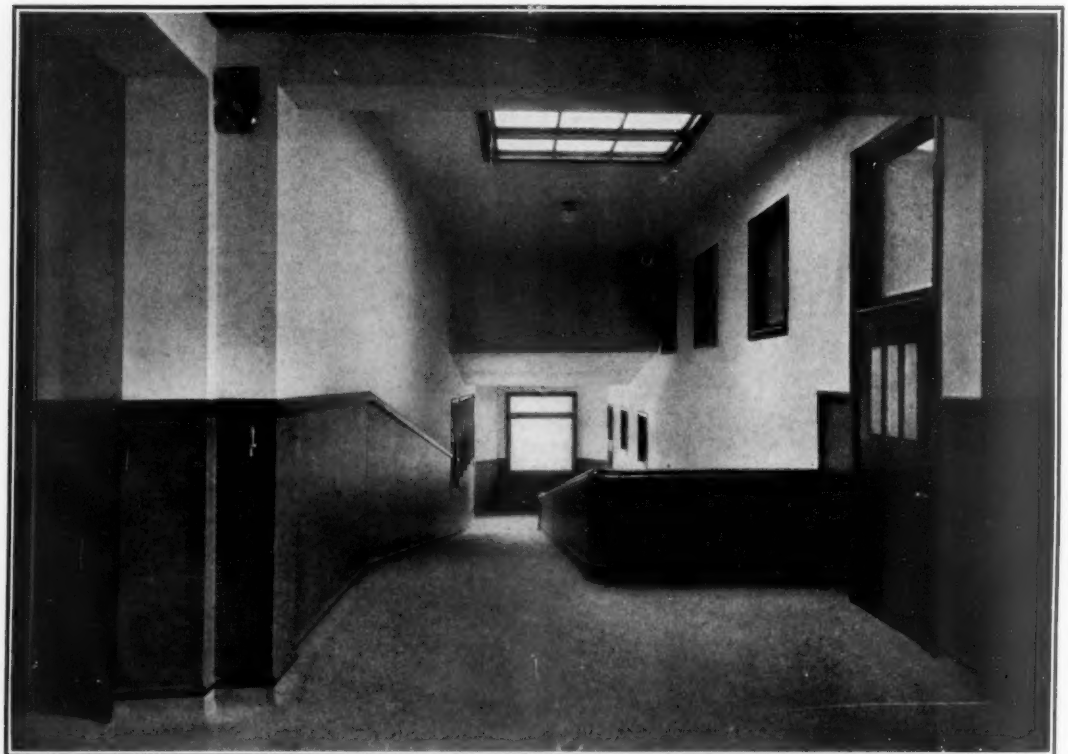
An Architect States the Case for Ramps

Architect W. H. Weeks, of San Francisco, who has probably planned more school buildings with ramps than any other architect in the country, has the following to say on the subject of ramps in schools:

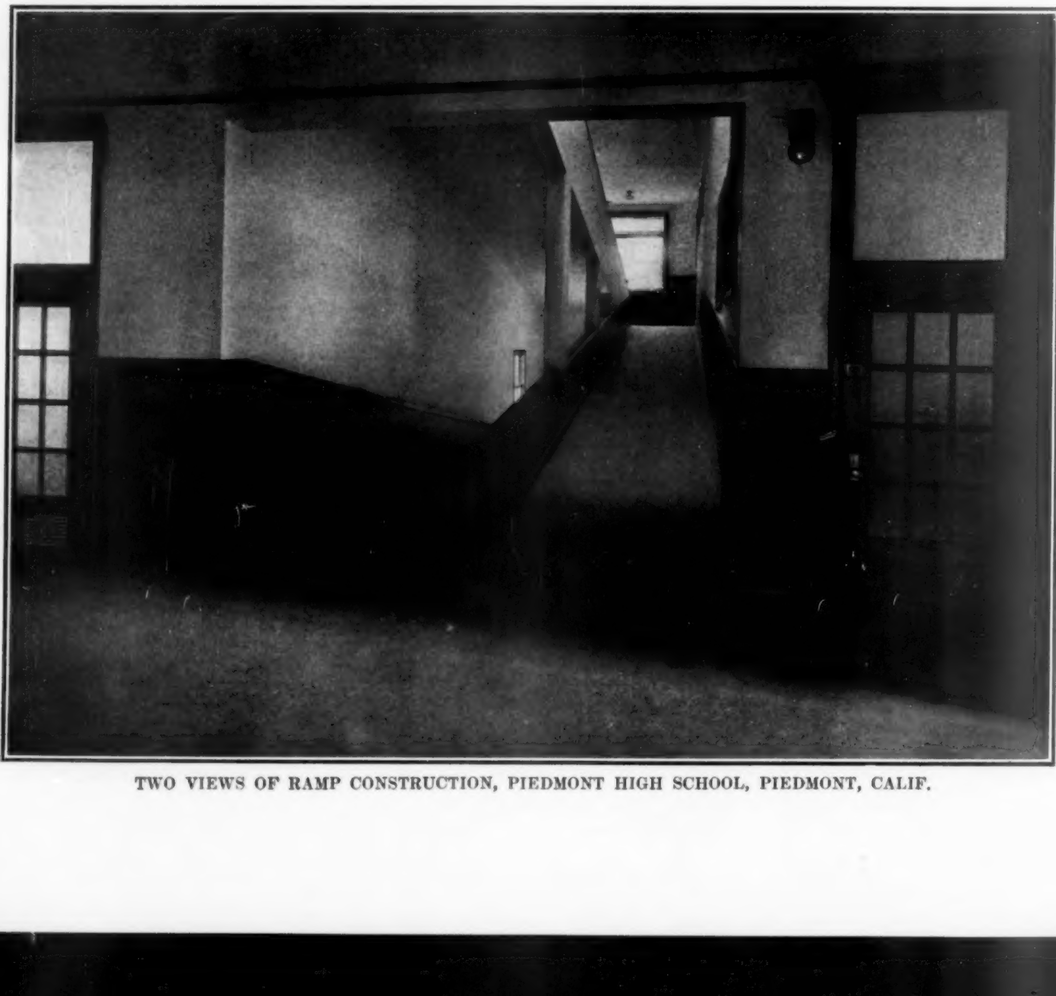
"First, ramps are practically 100 per cent safe in case of fire or panic. In checking up on the best-constructed stairways, I found that there have been many accidents caused by stumbling. I have not yet found a single instance of accidents from stumbling on any ramp placed in any school building that I have erected.

"Another advantage in the use of a ramp is the fact that pupils vary greatly in physical condition. The average stairway is built with a definite rise in which short and tall people, those physically weak and physically strong, are made to exert the same effort in raising the body from one step to another. In the case of a ramp it is possible for those who so desire to take a short or a long step as they are physically able.

"In several cases in my schools, where pupils have been incapacitated to such an extent that they had to be taken around in a wheel chair, it was possible for them to attend these schools only



W. H. Weeks, San Francisco, Architect



TWO VIEWS OF RAMP CONSTRUCTION, PIEDMONT HIGH SCHOOL, PIEDMONT, CALIF.

because ramps were provided, for they could be wheeled from one floor to another.

"Another point is the sense of security given to the average timid pupil in going up and down an incline, rather than climbing up and down a stairway.

"It is well known that the greatest casualties in schools where fire has occurred, or panics, have been caused by the pupils' stumbling on stairways. There have been no panics worthy of the name in any school that I have erected up to the present time. This does not mean that such panics will not occur in any school building, so that the great advantage of the ramp has not yet been proved in this one connection. If such panic should occur, I am very sure that the ramp will demonstrate its superiority over all types of stairways.

"The strong argument commonly advanced against the using of a ramp is on account of the expense, as the ramp takes up more room in a building. As a matter of fact, the ramp requires about double the space that an ordinary good stairway requires. This does not mean that this amount of space is taken out of the building. It means that space has to be added to the building.

"This argument against the ramp does not hold good to any great extent in actual construction. The cost, on the average, is slightly more for the ramp, but the ramp is of a cheaper type of construction than the stairway, and the labor involved, which is the big element in the construction of any building, is much less than in the construction of a stair. From actual figures that I have made, the average ramp does not cost over 10 to 20 per cent more than a stairway, and I believe the advantages of the ramp more than make up for any difference."

Conflicting Views as to Costs

Opposed to the above point of view relative to the cost factor, architect J. J. Donovan, in his "School Architecture," page 318, says:

"Inclines (ramps) unless placed in separate towers, are not practical for school buildings, and even then are out of all reason in cost compared to the cost of well-built stairways. The proof of this lies in the floor space necessary to accommodate the rise and run of the incline. For instance, no ramp or incline should be installed when the slope is greater than 1 to 8. (This is approximately the slope of the incline at the Grand Central Station, but not the one commonly used in high schools.) In other words, for every foot of height there should be 8 feet of run; for a story height of 14 feet 3 inches, the horizontal distance traveled back and forth should equal 114 feet. . . ."

On the matter of relative cost of construction of ramps and stairways, those who plan school buildings clearly disagree. The issue of cost, being a purely objective matter, should not, it seems, have to stand for decision on subjective argument. Conclusive experimental evidence based on "alternate bids" should be procured and the issue resolved. In the only instance of "alternate bids" on stairways and ramps of which the writer is aware, the contractor's bid on ramps was slightly lower than for corresponding stairways. A single case is of course insufficient to warrant a generalization. The number of cases under controlled conditions should be multiplied to the point where generalizations could be drawn.

Initial cost of construction, however, is but one aspect of the cost issue. The relative cost of janitorial service over the life of the building is involved. There would appear to be little if any reason to challenge the contention that a ramp can be cleaned much more quickly and at the same time more efficiently than a stairway. This saving in time and consequent labor cost over a period of years is an item worthy of consideration and careful investigation. Opposed to this factor of saving, however, may be placed the cost over an equal period of years of heating the additional cubage incident to the construction of ramps.

How Steep Should a Ramp Be?

Closely related to the question of cost and associated with the issue of time consumed in travel is the question of an acceptable pitch or slope for ramps in schools. The more gradual the slope, the longer the ramp required between floors. The opponents of ramps insist that no ramp should be permitted on which the slope is steeper than 1 to 8, while ramp advocates approve a slope of 1 to 6 or less. Assuming 13 feet vertical distance from floor level to floor level, a 1 to 8 slope would require a ramp 104 feet in length, whereas a slope of 1 to 6 would require only 84 feet. The difference is significant and raises the question of maximum permissible slope. The answer to this question is not so readily determined. Objective measures are less feasible than in the case of cost issues, but it is not beyond the realm of the possible to secure conclusive data if appropriate experiments are properly conducted. The difference in the physical effects such as pulse-beat and breathing-rate of pupils on stairways and ramps of different pitches could be measured with precision, the time consumed and consequent carrying capacity could be computed, and pupil preference for ramps of different pitch as against stairways could be secured. So far as known, little of this nature has been attempted. The nearest approach is reported by R. B. Bolton in *Cassier's Magazine*, Volume 41, pages 362-8, 1912. His studies were based on the ramps in the Grand Central Station, New York. In summary he reports as follows:

"The ramp at the Grand Central Station is 231 feet long, having a flat section near the middle which is 13 feet 9 inches in length, thus forming two inclines, one 115 feet, with a rise of 12 feet; the other 116 feet with a rise of 13 feet. The variation in the movement of different classes was found to be as follows

Men hastening	17 to 24 seconds
Women hastening	21 to 25 seconds
Two or more men together.........	23 to 27 seconds
Women carrying package or child...	28 to (?) seconds
Heavy and elderly men.............	30 to 38 seconds

"A striking difference was noted in the way men and women approached the incline. Upon first striking the ramp, a man would exert a greater degree of energy for a short distance, but a gradual and increasing slacking of his speed resulted. A woman, on the contrary, would slacken her speed immediately, her progress up the incline being much more uniform.

"The average man walks 320 feet per minute. On the first ramp his rate falls to 279 feet per minute, or 87 per cent. On the second ramp his rate falls to 249 feet per minute, or 78 per cent. The average speed upon the level part above the two ramps was found to be 283 feet, thus indicating a loss of 11.6 per cent from the normal.

"The average speed of a woman is 270 feet per minute, which falls to 240 feet upon the first ramp and 224 upon the second. The rate of speed upon the level at the summit is 251 feet, thus indicating a loss of 7 per cent from the normal.

"Where large numbers of persons are compelled to pass and repass, the elementary ramp offers some advantages, as regards safety and simplicity, over a stairway. The stairway is peculiarly dangerous to human life and limb under crowded conditions, and the effort required in ascent brings about a pronounced check in the movement of large bodies of persons in motion, which has been assumed to be absent from the ramp. A return has therefore been made to the incline plane, or ramp, as the means of access to or egress from several modern railroad stations."

The above statement falls short of what is needed in that no corresponding data are given for stairways or ramps of greater slope. The slope of the Grand Central ramps is slightly less than 1 to 9, but before drawing any inferences from this as to what the maximum slope of school ramps should be, one needs to consider the differences in the groups to be served. The ramps in a railway station are required to carry people of all ages from toddling infants to tottering adults; all sizes from midgets to mammoths; all ranges of physical health—the sick, the well, the weak, the strong, and people in all stages of inebriation, with a maximum of comfort and a minimum of delays with little regard for cost, while the ramp in a school building is required to carry, in the main, only the most vigorous, alert, and active group, namely, young people between the ages of ten and twenty. If a slope of 1 to 8 or 9 is appropriate for a random sample of the total population, a slope of 1 to 6 would certainly be correspondingly appropriate to the select group of climbing youth found in our schools.

Advantages and Disadvantages Generally Conceded

The points of major issue and debate having been discussed in the preceding paragraphs, it remains to point out the advantages and disadvantages of ramps that are generally conceded. Such advantages are: ramps are safer than stairways; less noisy; more sanitary; better adapted to frail or crippled children; more efficient agencies of egress in case of fire or panic; and more convenient for the movement of school furniture and equipment. The disadvantage that generally goes unchallenged is the difficulty of working them into a building plan. The problem of providing space for 40- to 45-foot runs in appropriate places in a building plan without interfering with the lighting or arrangement of other units of the plant, and without producing grotesque protuberances on the building, is no doubt a difficult one to solve, but it can be done and has been done successfully. It is not improbable, if the facts were known, that the difficulty of planning and design is more responsible for the limited installation of ramps than all other objections combined.

In conclusion, it may be said that the available data are insufficient to justify a positive and final stand either for or against the use of ramps in school buildings, but the importance of the issues involved, the apparent strength of the case in favor of ramps and, despite this, the almost universal use of stairways, emphasizes the need for serious consideration of the problem by both school men and architects, leading to the collection of conclusive experimental evidence.

Acoustical Treatment in the School and University

BY JOHN S. PARKINSON

STAFF ACOUSTICAL ENGINEER, JOHNS-MANVILLE CORPORATION, NEW YORK

THE progressive schools and universities of today are turning their attention to the question of sound control. For some time adequate provision for such factors as heat, ventilation and light has been part of correct modern design. Today, somewhat belatedly perhaps, but none the less with the same thoroughness, attention is being turned to the study of sound. The following brief discussion takes up a few of the more important aspects of acoustical treatment in educational institutions, and gives briefly certain suggestions as to location, type of treatment, etc.

The principal problem of teaching is rapid and efficient exchange of ideas. The teacher must be able to make himself clearly understood, and the pupil must have every opportunity to ask questions and to obtain complete understanding. In consequence, nowhere is the problem of correct hearing conditions more important, and nowhere do defects in acoustics make themselves more immediately felt. Furthermore, the school is expected to lead the way in all matters of education and progress. When any important contribution to the science of building is available, it is in the school that we expect first to find it put to practical use.

The matter of sound control in schools divides itself naturally into three general headings: the first is what may be called correction of hearing conditions; the second is the problem of noise reduction or general quieting; and the third is soundproofing, that is, the insulation of one room and one floor from another.

Lincoln Rogers, Architect

AUDITORIUM, SAN DIEGO, CALIF., HIGH SCHOOL
Contains 7,000 square feet of acoustical treatment

TYPEWRITER ROOM, OAK PARK, ILL., HIGH SCHOOL
Treated with tiles, 16 inches square, on ceilings and walls

Correction of Hearing Conditions

Treatment for correction has certain obvious uses. Fundamentally, it is designed to make communication simpler. It enables the teacher to express himself with not only less mental but less vocal effort, and it enables the pupil to follow carefully what is being said. Superficially, it seems strange that a problem as fundamental as this matter of communication via the spoken word should not have been given more thought. Probably the answer lies in the fact that the speaker seldom knows just how well he is making himself understood, and because of the limitations of the ear itself the listener does not always know where or how to place the blame. It remained for scientific investigation to show that analysis of the average auditorium or lecture hall in many cases indicates ways in which the system of verbal communication can be immeasurably improved.

Acoustical correction also implies the additional advantage that it makes it simpler for the professor or instructor to hold the student's attention. The ease with which the average pupil is distracted is notorious. It seems probable, however, that a major part of this distraction may be laid to the fact that the undue effort required in hearing produces an unusual degree of fatigue. In the average school building there is a tremendous variety of extraneous noises, many of which, such as conversation from other rooms, music, etc., are peculiarly effective in drawing the listener's attention. When improved communication is made possible between teacher and pupil, the number of errors that are likely to occur is tremendously reduced. It seems possible that here, too, the average pupil has not really been given his fair due. A certain number of errors due to inattention or stupidity are to be expected, but it hardly seems fair to blame the pupil for errors due to faulty hearing conditions.

Noise Reduction

The preliminary report of the New York Noise Abatement Commission, which includes among its members a number of eminent doctors and professional men, states that:

> "The noise of the streets interferes with attention and concentration. It makes the task of teachers and pupils more difficult."

and again:

> "Noise interferes seriously with the efficiency of the worker. It lessens attention and makes concentration upon any set task difficult. In the attempt to overcome the effect of noise, great strain is put upon the nervous system

leading to neurasthenic and psychasthenic states."

The conclusion is readily applied in schools, and points to the fact that noise reduction operates not only for better study conditions, but also for improved physical health of the pupils. The fact that sound hinders concentration is an experience familiar to everyone. The marked relief, however, which can be obtained by the use of adequate quieting methods is not so generally known.

Soundproofing

Soundproofing includes the insulation of walls, floors, ventilating ducts, passages, etc., against the transmission of sound from and to various parts of the building. The average school houses a large number of different types of activity. There are band and music practice rooms, generally at least one auditorium, laboratories, machine shops, gymnasiums, etc., all under a single roof. In each of these places a certain type of sound is necessary and must be tolerated. The combined effect of these various sounds, when transmitted through the building structure into the study rooms, is incalculably harmful. Yet the paths which the sounds may take in traveling to various parts of the building are myriad, and nothing less than careful study and planning *before* the building is built can insure proper sound insulation. However, once the problem is thoroughly analyzed, it is possible to take the necessary steps, and almost complete insulation may be obtained. The modern broadcasting studio is a case in point. Rows of these studios may be placed side by side, and the programs never interfere with one another. The same ideal condition can be realized in the school classroom, but it calls for thorough analysis.

Where Treatment is Needed

We come now to a consideration of the actual location of corrective or quieting treatment. The problem of correct hearing conditions is, of course, of paramount importance in all auditoriums and lecture halls. Any large room is liable to acoustical defects, most of which are familiar to the average person. Among them may be listed reverberation, echoes, inadequate sound distribution, etc. Classrooms in general require more consideration from the standpoint of quieting than from that of actual correction. However, a number of large classrooms in various schools throughout the country have been treated with conspicuous success from both points of view. Under the heading of corrective work should also be included the

CAFETERIA, JOHN HAY HIGH SCHOOL, CLEVELAND, OHIO
Quieted with over 3,000 square feet of acoustical materials

band and music rooms. One band leader in a Middle Western school, where treatment was installed, commented that he had actually heard his band for the first time as it really sounded. For the first time in his career as a teacher was he able to pick out the individual instruments in their relation to the whole and make the necessary criticisms.

Treatment for quieting should be installed in swimming pools, gymnasiums, the cafeteria, if there is one, workshops, library, typewriter rooms, and in corridors wherever possible. Most of these should need no special discussion. Now and then an educator or architect expresses surprise that treatment should be recommended in swimming pools. A little thought, however, makes the reason apparent. It has always been an accepted fact that swimming pools should be noisy and reverberant. There is no good reason for this. A quiet pool is not only vastly more comfortable and pleasant, but also much safer for all concerned.

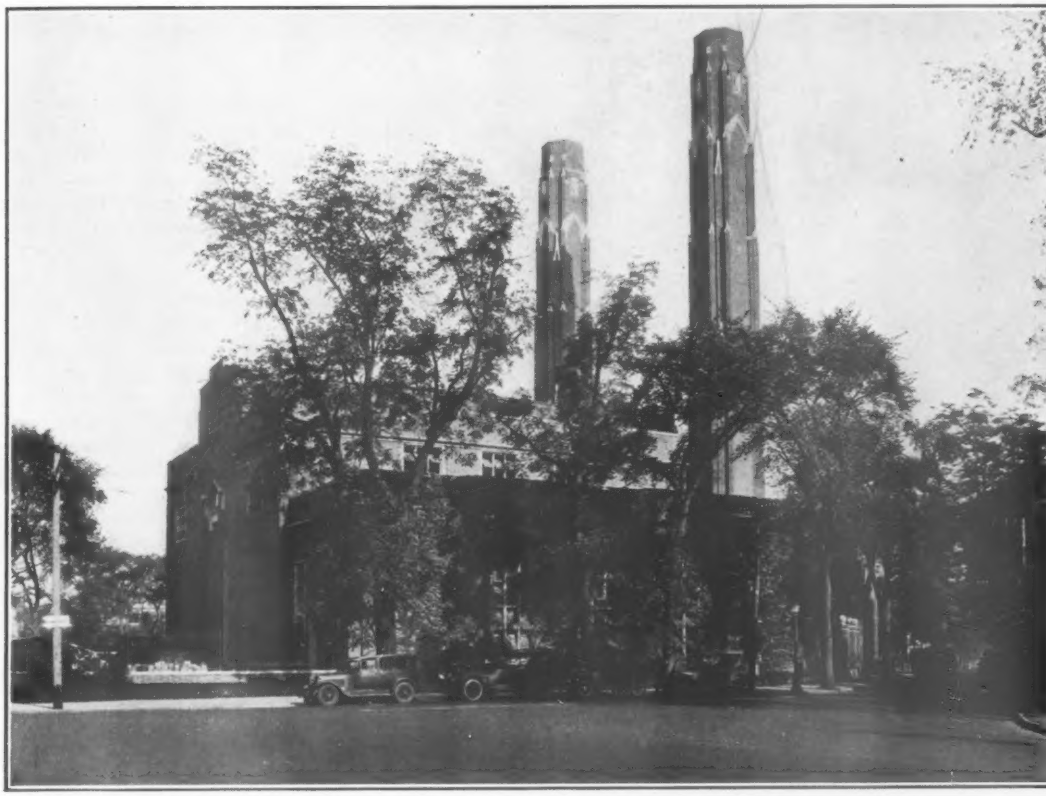
Treatment in school corridors is recommended not so much for the direct benefit of those in the corridors as to aid the effectiveness of the precautions observed in soundproofing. In the average school more noise is generated in or conveyed along the long echoing corridors than through any other channel of communication. It is extraordinarily simple to correct this condition, since an efficient sound absorbent treatment on the ceiling of the average low-ceilinged corridor will provide a tremendous reduction in the sound present therein.

One other point seems of interest here. It is one which has not been specially stressed in the past, but which seems to be assuming considerable importance. There is an increasing tendency to add various forms of vocational education to the curriculum of the public schools. In most cases this means, first, the building of shops for wood and metal working, which in turn inevitably means the scream of saws, the whirring of lathes, etc. One of the writer's most vivid recollections of his preparatory school is the peculiar penetrating scream of the bandsaw in the manual training department. This saw was located in the basement of the school, but it could often be heard throughout the entire length and breadth of the building. A quieting treatment would have remedied this, more particularly because the average sound-absorbent material is especially efficient at the upper frequencies.

Qualities Needed in Sound-absorbent Material

The actual physical requirements of a sound-absorbent material are very much the same whether it be used for purposes of correcting hearing conditions or for quieting. In either case, the most efficient material is always the most desirable. In certain cases, as in the band and music rooms, it is necessary to have a material which is efficient over a larger range of frequencies. A material which is to be used in a public building, such as a school, should be fireproof and permanent. So far as possible, it should not be subject to deterioration either in efficiency or in appearance. Its exterior appearance should be pleasing, and in the case of auditoriums especially, it should be as nearly as possible adapted to all forms of architectural treatment. It should be vermin-proof and readily cleaned or washed. The cost and trouble of upkeep are important factors. Whether used in classrooms, auditoriums or gymnasiums, or in a library, its coefficient of light reflection should be high, and it should be possible to maintain its light-reflecting quality over a long period of time.

In conclusion, it should not be necessary to stress the increasing application of acoustical treatment in the schools of today, other than to remark that nearly everywhere city and state architects are specifying this work as part of their standard construction. Adequate control of sound is recognized everywhere as a matter of paramount importance, and every effort is being made to keep up with the rapid advance of acoustical science.



THE CENTRAL HEATING PLANT AT YALE UNIVERSITY, NEW HAVEN, CONN.

Central Heating Plants for Universities

BY G. B. NICHOLS

Mechanical Engineer, New York

ON account of the rapid growth of institutions of higher learning during the last ten years, and also the development of more efficient fuel-burning equipment, the question of centralizing the heating plant in one large unit or the redesigning of the original plant, is being considered at practically all the universities throughout the country. As the item of coal alone at some of our larger universities amounts to over 30,000 tons a year, it will be realized that careful consideration of the proper design of the heating apparatus is of great importance.

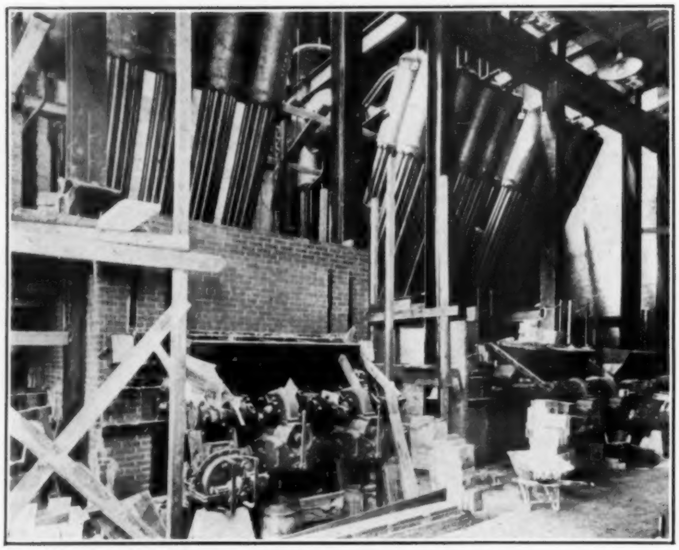
Factors Needing Consideration

In arranging for a central heating plant the following methods of approach are recommended.

A complete block plan of the entire site should be made to scale, showing the general contour of the land. A mechanical survey of all the buildings should then be made and a determination of the heating requirements based on pounds of steam per hour should be assigned to each building. These quantities should be indicated on the block plan. A study should then be made of the arrangement of the underground heating main between the available sites of the central heating plant and the buildings, to determine the most economical arrangement and location of the plant.

In general, it will be found that underground mains do not follow in direct lines but have to adapt themselves to the various arrangements of buildings, of which there are many at each college.

In locating the heating plant, consideration should be given to the methods of bringing in coal and the removal of ashes. In general, the coal should be delivered directly to the coal hoppers at the plant by gravity from the railroad siding. In some cases, also, it will be advantageous to deliver the ashes direct to railroad cars, although in most cases these are removed



THE YALE PLANT'S BOILER ROOM UNDER CONSTRUCTION

from the plant by trucks for nearby building purposes, grading or road building.

Consideration should also be given to the prevailing wind, so that there will be no complaint on account of smoke or cinders from the stack. This last item is of extreme importance, particularly if it is proposed to operate the boilers at overloads with forced draft, and it is most important if powdered coal is to be used as a fuel, in which case the plant must be located well away from the institution grounds. The plant should also be located so as to be supplied by a sufficient water service suitable for boiler feed use.

Curves should then be developed showing the probable daily and hourly load at the plant, together with the yearly fuel consumption and operating force necessary, so as to determine the proper size of boilers and equipment, together with the proper fuel to be used.

Various Fuels and Distribution Methods Available

In the item of fuel, there are available hard coal of various sizes, soft coal, fuel oil, and powdered coal. Consideration should be given to each, and a final selection should be made after determining the annual cost of each fuel and its probable stability in price for the location of the plant.

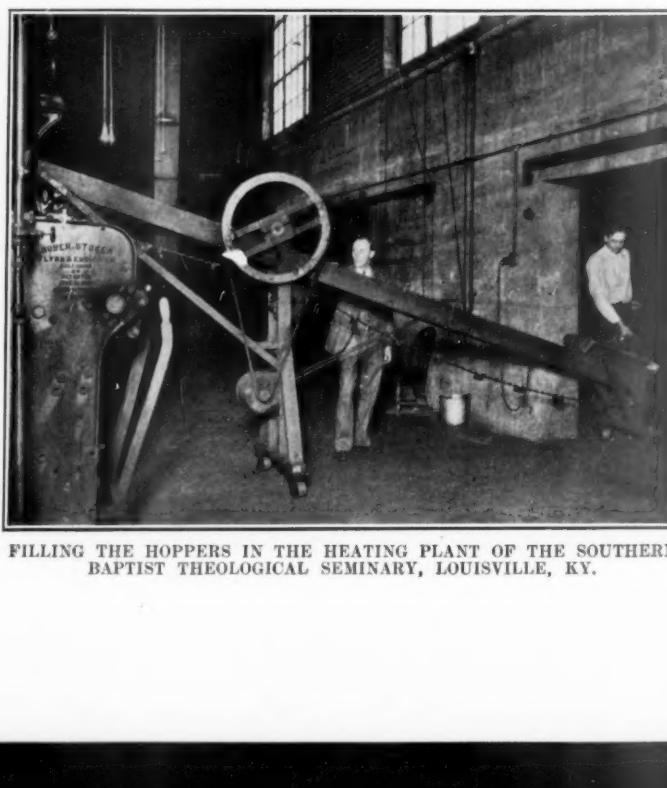
In the item of distributing system, three mediums are available: forced hot water; high-pressure steam; low-pressure steam.

Forced hot water systems have in the past been considered quite seriously, and there are a number of noteworthy installations. At the present time, however, in most cases it works out more economically to supply the distributing lines with high-pressure steam at full boiler of slightly reduced pressure, depending on the load, and reduce the pressure through pressure-reducing valves at the entrance to each building.

The returns are generally piped to some low point at the center of each group of buildings, where some form of pumping apparatus, generally electrically driven pumps, is installed, which pumps the condensate into the main return line leading back to the central heating plant.

Three methods are available for the installation of heating pipes—in a walking concrete tunnel, a small concrete box, or some form of tile construction. All three systems are in use, and the decision which to use is based entirely on the cost. In general, walking tunnels can justify their cost only along the main arteries and then in very limited amounts. For pipes passing under railroad tracks, or subjected to heavy loads, there are now on the market cast iron conduits in which they can be installed. The character of soil should also be considered.

In general, heating plants consist of plain brick structures in the larger universities, two stories in height, the basement floor being at ground level, in which is installed the ash removal cars force draft and pumping apparatus. On the second floor are installed the boilers with their



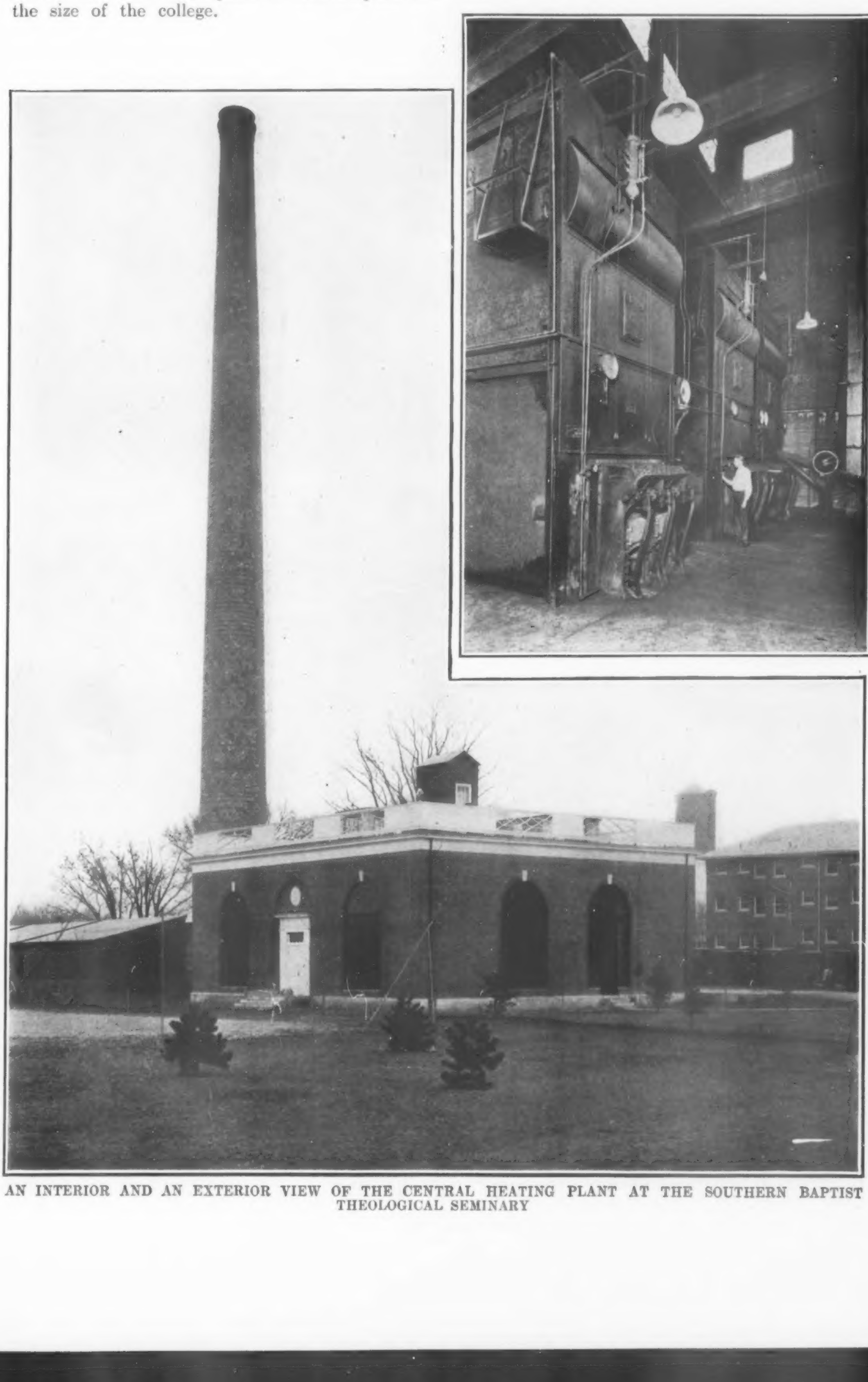
FILLING THE HOPPERS IN THE HEATING PLANT OF THE SOUTHERN BAPTIST THEOLOGICAL SEMINARY, LOUISVILLE, KY.

stokers or oil-burning equipment, elevated coal bins delivering the coal directly to the boilers.

Four typical installations varying in size are shown herewith. Each plant is well adapted to the size of the college.

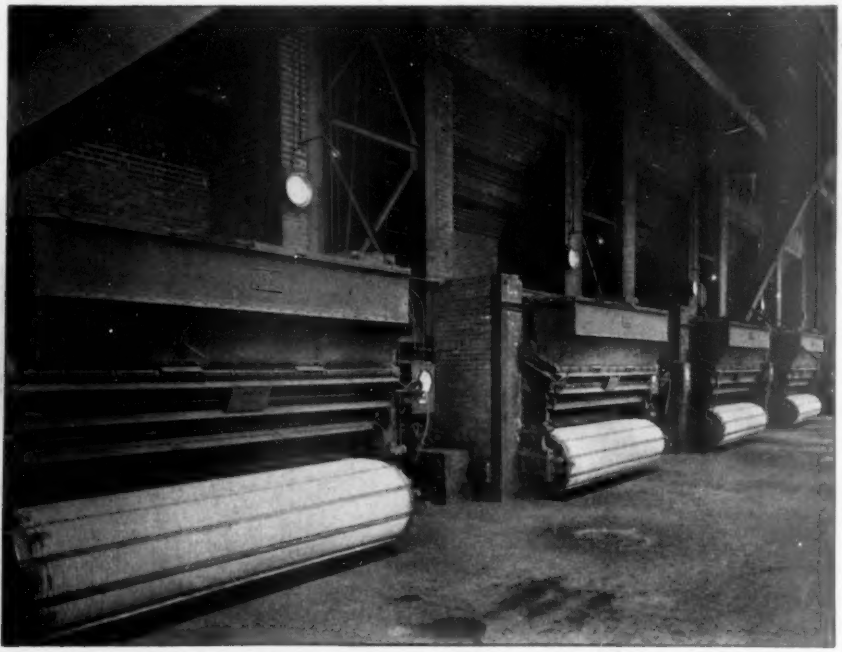
The Cornell Plant

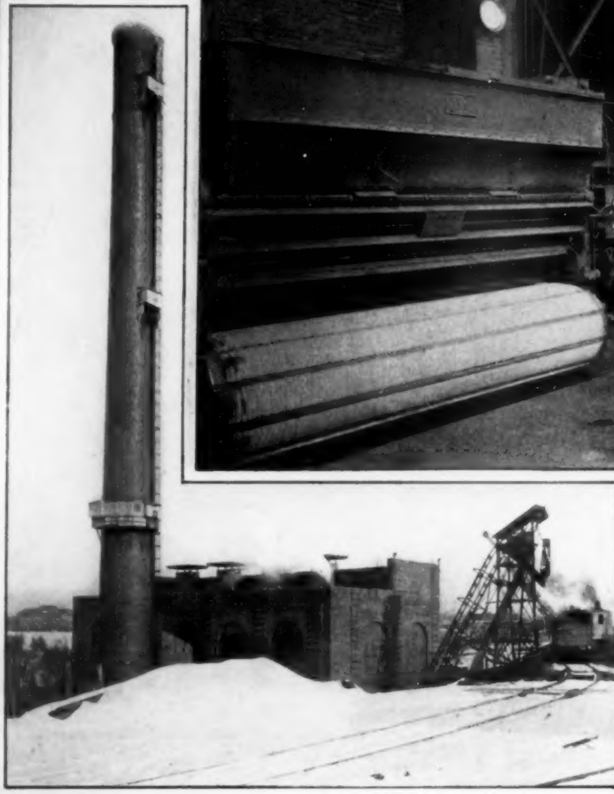
The Cornell installation is a very noteworthy one, as it represents a plant along the lines of



AN INTERIOR AND AN EXTERIOR VIEW OF THE CENTRAL HEATING PLANT AT THE SOUTHERN BAPTIST THEOLOGICAL SEMINARY

TWO VIEWS OF THE HEATING PLANT AT CORNELL UNIVERSITY, ITHACA, N. Y.





commercial industrial plants, and consists of five boilers rated at 612 hp. each in one row. It is now proposed to install a second row of boilers on the opposite side of the boiler house, together with an additional chimney. The boilers are of the Sterling type as manufactured by the Babcock & Wilcox Company. The other equipment in the heating plant consists of Cox chain grate stokers, Link-Belt coal-handling equipment, Baker Dunbar ash hoppers, and an Alphonsus Custodus brick smokestack 11 feet in diameter and 225 feet high. The steam is delivered to the campus through a main steam pipe 12 inches in diameter, which reduces to 10 and 8 inches; and it is delivered for a distance of 1¼ miles from the heating station, which is the farthest point served. About 30,000 tons, or 700 cars, of anthracite coal, barley size, is used annually to heat the buildings on the campus. The coal is handled and the ashes are removed entirely by machinery. The coal comes in on a trestle at the south end of the plant, and is dumped into a large hopper. It is taken from there by coal-handling equipment into a coal-bin of 700 tons capacity in the top of the building. From there, the boilers are fed mechanically, the coal being weighed while on its way to the boilers. The ashes are also handled by machinery, and in no part of the heating process is it necessary for the operator to touch either the coal or the ashes. Coal and ashes are weighed carefully and all water going into the boilers is metered, so that a close record of the efficiency of operation is kept. The unit cost for steam at Cornell compares favorably with the most economical figures of large industrial corporations.

By means of a meter which records the amount of steam furnished, each building is charged with operating costs. Fixed charges consisting of an allowance of 4 per cent for depreciation and interest at 5½ per cent are added. In this way the heating plant is paying for itself.

Particular attention should be called to the three observation platforms located on the stack. Numerous tests have been conducted by the students at this university to determine the conditions of the interior of the stack under varying loads, and it is to be hoped that this observation will result in considerable information regarding the subject.

The Yale Installation

The plant at Yale is of very fine architectural design, well in keeping with its city location. Its chimneys are quite unusual, and show that such structures can be made architecturally pleas-

ing. The general description of the heating plant is as follows:

It was built with an ultimate capacity of ten 500-hp. normal rating, water-tube boilers, eight of which have been installed, and these boilers have a 150 per cent overload capacity for a period of at least two hours.

The boilers are all served by Riley automatic stokers and operate under forced draft. The coal is dumped into a hopper outside the building direct from motor trucks, descending by gravity to a crusher, and is carried by automatic machinery to overhead bunkers, from which it is fed by gravity to the stoker hoppers. The coal as it is supplied to the stokers is weighed by automatic machinery, so that a daily record of the consumption of each boiler is kept.

Each boiler has on it a steam flow meter by which each day a check is kept of the evaporation obtained on the boiler as well as on the whole plant. The feed water, mostly condensation from heating appliances served from this plant, passes through a feed-water heater and meter before it is fed to the boilers. A high-grade bituminous coal is used, and the evaporation in the plant averages very close to 11 pounds of water per pound of coal from 212° F.

When the fires are cleaned, the ashes are dumped into bucket cars in the basement of the plant; these are pushed along a track to one end of the building and dumped in a hopper where ash-handling machinery elevates them to overhead bunkers, and they are then discharged by gravity into motor trucks for removal. The plant, although furnishing heat, light and power current for a very large group of buildings, is operated with a small personnel.

A Moderate-sized Plant at Louisville

The views of the central heating plant of the Southern Baptist Theological Seminary at Louisville are noteworthy as showing a central heating plant supplying a moderate-sized University, and indicate a fine architectural design in harmony with other University buildings.

On account of the amount of coal used, it was not economical to have a heating plant of more than one story. Coal is delivered to the coal vault from trucks driving over the top of it. Three Henry Vogt 165-hp. water-tube boilers equipped with Huber stokers were installed in the plant. The boilers are capable of carrying a considerable overload, so that this plant is well adapted to take care of the University.

The University of Michigan Picture

An illustration is also given of the power-plant at the University of Michigan, which consumes approximately 44,500 tons of coal per year and is different in construction from the other plants.

THE POWER-PLANT AT THE UNIVERSITY OF MICHIGAN, ANN ARBOR

Prize-Winning Entries in the 1929 Common Brick Schoolhouse Competition

Dean and Dean, Sacramento, Calif., Architects

THE CLARKSBURG HIGH SCHOOL, CLARKSBURG, CALIF., WAS DESIGNATED THE BEST SMALL BUILDING

Andrews, Jones, Biscoe and Whitmore, Boston, Mass., Architects

SECOND PRIZE IN THE SMALL-BUILDINGS CONTEST WAS AWARDED TO BRAKER HALL, TUFTS COLLEGE, MEDFORD, MASS.

Murphy and Lehmann, Brooklyn, N. Y., Architects

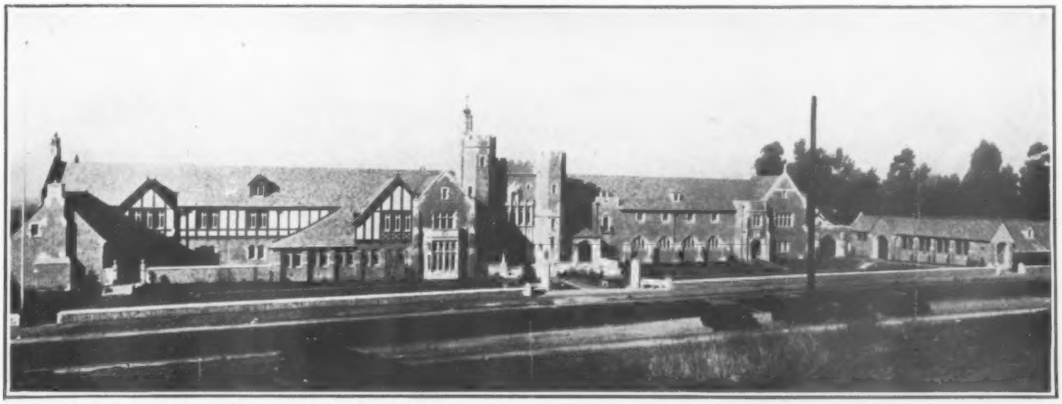
THE RESURRECTION SCHOOL, RYE, N. Y., RECEIVED THE THIRD PRIZE IN THE SMALL-BUILDINGS COMPETITION

THE possibilities of the common brick as a factor in economy and beauty of schoolhouse design have been demonstrated in the competitions conducted by the Common Brick Manufacturers' Association in 1928 and 1929. Six prize-winning entries in the 1929 competition are here shown. Small buildings and large buildings were considered in separate classes in the 1929 competition. The three schools shown on this page ranked highest in the first group, while those on the opposite page were judged the best three among the large buildings entered.

The attitude of some of the leading schoolhouse architects toward common brick is reflected in the following paragraph from the statement made by William B. Ittner, Jr., of St. Louis; J. O. Betelle, of Newark; and W. R. McCornack, of Cleveland, judges of the competition in the first award:

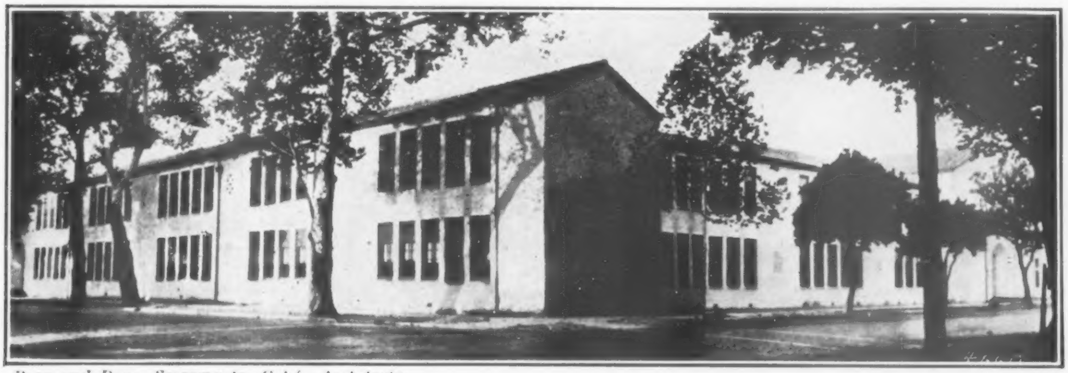
"Common brick is admirably adapted to school design. Bricks of this character are locally and readily obtainable in almost every part of the United States, and they give opportunity for that rare quality which marks the success of many of our most modern schools. Common brick also gives an opportunity for economy in the expression of good architecture in the hands of skilled designers, while at the same time it produces a building of good structural quality."

The whitewashed and painted school building was decidedly more in evidence in the second competition than in the first one. Possibly this was because the Southwest was more liberally represented than in the first. The Spanish traditions still hold in that territory, and this requires the whitened wall. This treatment is also increasing in some parts of the South. Mostly, however, the old ideas prevailed, although there were a few striking innovations in bond and joint treatment from California and some skintled brickwork in the later buildings. Natural colors were strongly favored.



Miller and Warnecke, Oakland, Calif., Architects

THE EAST OAKLAND HIGH SCHOOL, OAKLAND, CALIF., RECEIVED THE GRAND PRIZE AND FIRST PRIZE IN THE LARGE-BUILDINGS COMPETITION

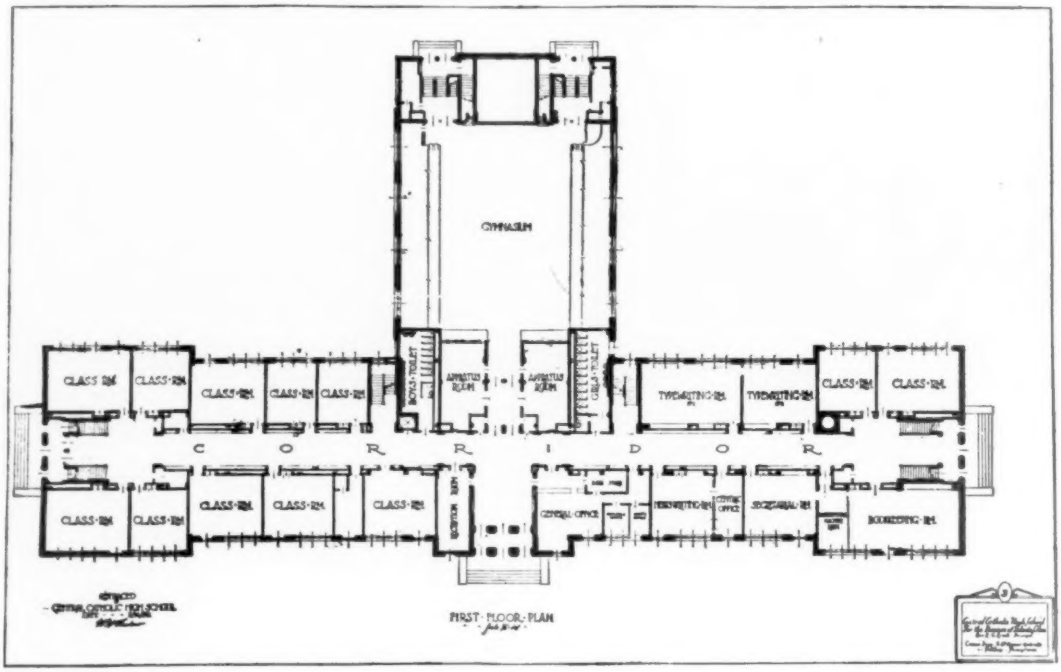


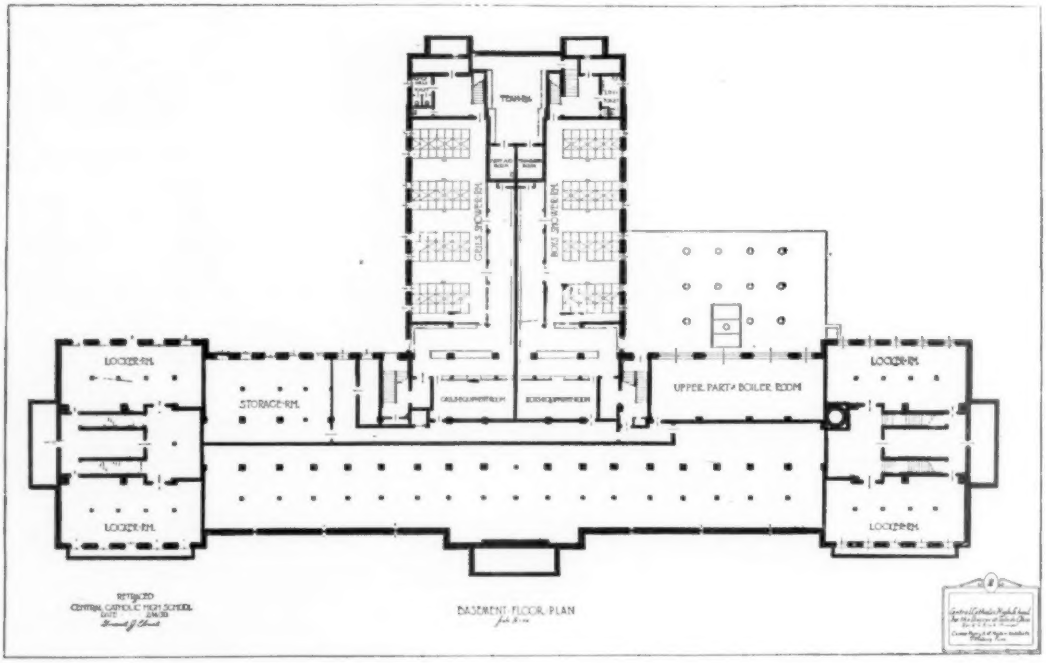
Dean and Dean, Sacramento, Calif., Architects

THE LINCOLN ELEMENTARY AND JUNIOR HIGH SCHOOL, SACRAMENTO, CALIF., WAS AWARDED THE THIRD PRIZE IN THE LARGE-BUILDINGS COMPETITION

G. Howard Chamberlin, Architect; Anthony Fairbrook, Associate; Yonkers, N. Y.

THE ROOSEVELT HIGH SCHOOL, YONKERS, N. Y., RANKED SECOND IN THE LARGE-BUILDINGS COMPETITION



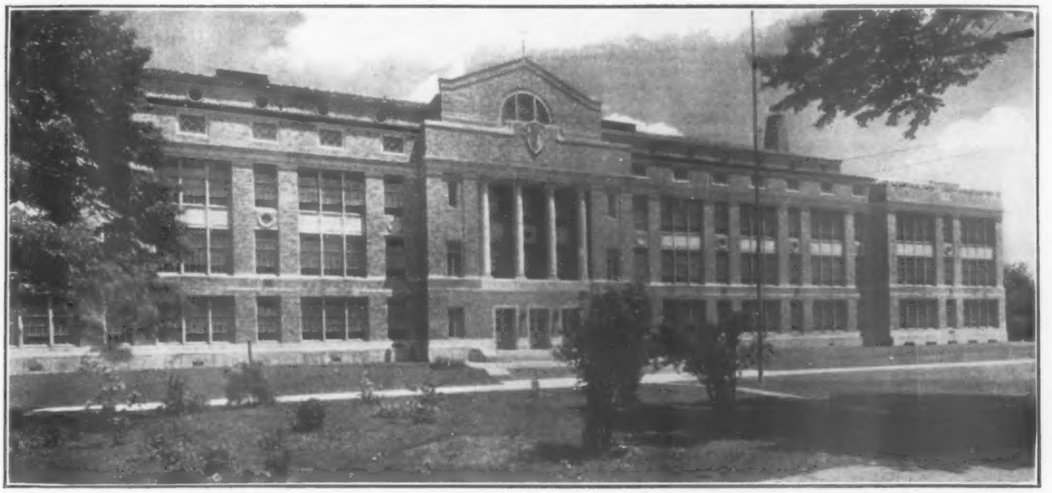


CENTRAL CATHOLIC HIGH SCHOOL, TOLEDO

Other features of the building are as follows:

Second floor.—Gymnasium, projection room, library, two study halls, two rest rooms, girls' and boys' toilet rooms, art room, exhibition room, and thirteen classrooms.

Third floor.—Cooking room, bedroom, dining-room, living-room, sewing-room, three science rooms, biology room, chemical laboratory, physics laboratory, girls' and boys' toilet rooms, and twelve classrooms.



The New Central Catholic High School, Toledo, Ohio

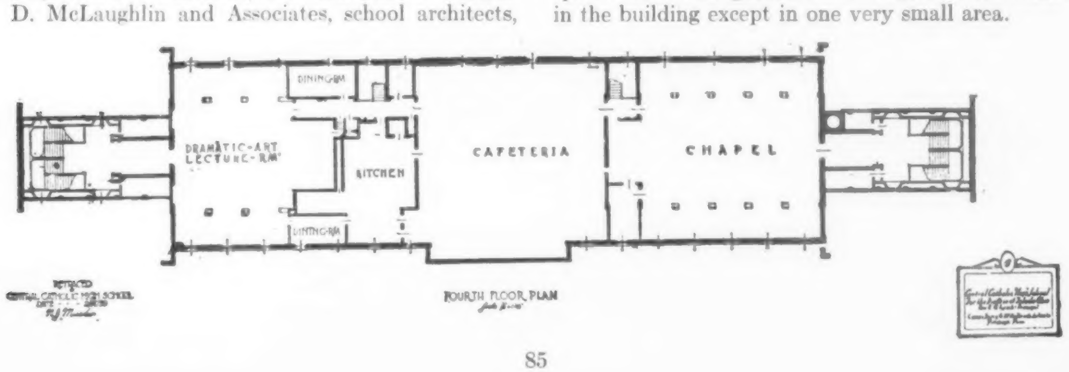
BY REV. R. G. KIRSCH

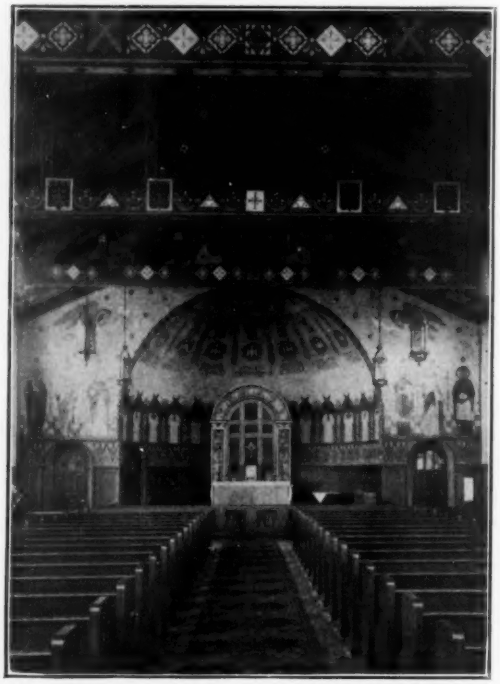
PRINCIPAL

IN February, 1929, the new Central Catholic High School building in Toledo, Ohio, was completed and ready for occupancy. Ground had been broken on March 3, 1928, on a 10-acre site, centrally located.

The building was designed to accommodate 1,500 students who come from some 35 parishes of Toledo and its suburbs. The School (a growing institution) was in operation in temporary and rather inconvenient quarters for several years prior to the erection of the new building. The necessity of using these inadequate quarters brought out quite strikingly the desirable features that should be embodied in the new building. Most of the features that the old quarters lacked were carefully planned in designing the new building. Comes, Perry and McMullen of Pittsburgh, Pa., were the architects, with the firm of Thomas D. McLaughlin and Associates, school architects, of Lima, Ohio, engaged in an advisory and supervisory capacity. The combination of a knowledge of the needs of the departments of the school, and skillful architects, resulted in a school building which appears to be quite practical and economical as well as architecturally interesting.

The building is four stories in height and of fireproof construction throughout. Steel frame construction was used, with floors of concrete, walls of brick with stone trim, and roof of tile. The first three floors constitute the school building proper. The fourth floor includes a chapel, a cafeteria, and a dramatics and music practice room. The cafeteria was located on the fourth floor for the double purpose of removing cooking odors from classrooms and of utilizing the attic space under the gabled roof. There is no attic in the building except in one very small area.





THE CHAPEL OF THE NEW CENTRAL CATHOLIC HIGH SCHOOL, TOLEDO

The First Floor

The first floor houses the office, which is to the right of the main lobby, the commercial department rooms, the school newspaper office, thirteen classrooms, a reception room, and a rest room. A combination auditorium and gymnasium opens directly off the lobby opposite the main entrance. Folding iron gates are placed so as to close off the school on occasions when crowds are attending evening affairs in the auditorium. The auditorium-gymnasium has a regulation-sized basketball floor surrounded on three sides by concrete bleacher-type stands which will comfortably accommodate one thousand spectators. There are no columns to obstruct the view. The 80-foot span across the auditorium-gymnasium is man-

THE AUDITORIUM-GYMNASIUM

CORRIDOR, FIRST FLOOR

aged by the use of arched steel trusses which add to the interior appearance. At one end is a stage which can be used for dramatic, musical, or assembly purposes. For stage presentation 600 folding chairs can be placed on the gymnasium floor. Directly below the gymnasium are found the boys' and girls' locker and shower rooms. These are well lighted from windows under the gymnasium bleachers. Showers for gymnasium classes are arranged in four stacks of seven showers in each of the two large rooms. Each shower is placed between two dressing-rooms. The facilities accommodate 56 students at one time. The boys' and girls' shower rooms are exact duplicates in arrangement. Adjoining the boys' shower room is the team room used by the several athletic squads during the year.

Second and Third Floors

On the second floor are concentrated classrooms, study halls and the library. The library is in the front center of the second floor, with a study

hall adjoining on either side. There are thirteen classrooms on this floor, also the art room, carefully placed in accordance with proper lighting requirements.

The third floor houses the three laboratories for physics, chemistry and biology with their accompanying auxiliary rooms, as well as two general science rooms, a science lecture room, the home economics department, including cooking room, sewing room, model apartment, laundry, fitting room, and supply room. In addition, there are twelve classrooms on this floor. Toilet rooms are conveniently located on each floor.

EXHIBITION ROOM, ART DEPARTMENT

The mechanical drawing department, whose students prepared the drawings used in this article, is housed in a separate building, admirably suited for the purpose, which was constructed prior to the construction of the main building. One year of occupation has revealed no unsatisfactory condition in the layout of the building.

THE CAFETERIA

Equipment and Finish

Students' lockers are recessed into the corridor walls wherever possible. Basement locker rooms supply the deficiency of corridor space. Each classroom is supplied with a bookcase and a teacher's private cabinet locker recessed into the wall. Particular attention was given to supplying ample recessed cabinet space in every room where the type of work renders such cabinets desirable; also to the provision of preparation rooms, stockrooms, offices and the like in connection with the laboratories and other special rooms. Care was taken in the general layout so that supervision and administration problems would be reduced to a minimum.

The combination auditorium-gymnasium was provided, not because separate rooms were undesirable, but for purposes of economy.

A low-pressure heating system using welded steel boilers is giving complete satisfaction. Unit ventilators and auxiliary direct radiators provide for the heating and ventilating requirements.

The interior walls are finished in cream-colored plaster, except in the assembly rooms, where stucco was used. The corridor wainscot is of glazed tile of a pleasing blue shade. The corridor lockers are finished in the same color. The wainscot in all vestibules and in the main lobby is of marble. The corridor floors are of tile in three colors carried out in neat design. Terrazzo treads and landings are used on all stairways. Tile floor is also used in the cafeteria, cement floors in the

THE CAFETERIA KITCHEN

locker and shower rooms, while the classroom floors are of maple.

The building is well adapted to the requirements of a general high school offering courses to meet the varying needs of the students. It was built at a cost of about 32 cents per cubic foot.

THE LIBRARY

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Acoustical Treatment—The Celotex Co.
Auditorium Seating—Theodore Kundtz Co.
Boilers—Pacific Steel Boiler Corp. of Illinois
Cafeteria Equipment—Cleveland Range Co.
Classroom Furniture—National School Equipment Co.
Clocks and Signal Systems—International Time Recording Co.
Fire-Alarms—Autocall Co.
Flooring, Tile and Terrazzo—Art Mosaic & Tile Co.
Heating and Ventilating System—American Blower Co.
Interior Telephone Equipment—Automatic Electric, Inc.
Laboratory Furniture and Library Equipment—W. M. Welch Mfg. Co.
Lockers—Durabilt Steel Locker Co. and Fred Medart Mfg. Co.
Office Equipment—Art Metal Construction Co.
Sanitary Equipment and Plumbing—James B. Clow & Sons
Stonework—Indiana Limestone Co.
Heat Regulating System—National Regulator Co.

Structural and Decorative Possibilities of Concrete Construction

BY WYATT BRUMMITT
PORTLAND CEMENT ASSOCIATION

ARCHITECTS discovered, a few years ago, that there is no fundamental reason why schools should be unattractive. The Little Red Schoolhouse served its purpose, but it certainly instilled no fundamentals of esthetic or architectural appreciation in the minds of its scholars.

Architecture, good, bad and indifferent, surrounds everybody. The future appearance of the country's buildings depends largely on the subconscious architectural training students receive in their early years. If their school is a good job, better things can be expected of them when they grow up and start designing buildings for another generation.

An Honest, Plastic Material

One of the controlling factors in architecture of any type is the material in which a design is realized. The day when one material was tortured into simulation of another is past. Architects—and people generally—no longer condone such essential dishonesty.

Concrete, as a structural material, is plastic, figuratively as well as materially. It can be made to take on an infinite variety of forms, shapes, colors and textures. And for this reason it has frequently been forced to play the part of camouflage, performing misrepresentation unworthy of an essentially honest material.

The possibilities inherent in concrete construction are great for either large or small buildings. From a purely structural standpoint, it affords strength, fire safety, low original cost and minimum maintenance. As such, concrete has won recognition throughout the world within the last ten or twenty years.

But it has been only within the last few years that architects have taken advantage of concrete's decorative possibilities. Out on the west coast, particularly, concrete has played the feature rôle in a new architectural drama. Concrete schools, clubs, churches, libraries, homes, office buildings, have gone up in large numbers, presenting architectural modernism at its best. In these buildings no effort has been made to hide the true nature of the material used in the construction. Rather, advantage has been taken of concrete's unique ability to lend itself to any desired form, texture or color. As a result, the buildings have a spirit of freedom and integrity about them that is refreshing.

Decorative Use of Concrete

Scientific research has established a sound technique of concreting. Every competent architect and builder understands this technique, and relies on it to produce strong, safe work. The technique of utilizing concrete in decoration is newer, but it is by no means a matter of untried novelty.

Hewitt and Brown, Minneapolis, Architects

WAYZOTA HIGH SCHOOL, WAYZOTA, MINN.

An unusual design in which use is made of a cement stucco finish together with structural concrete in vital portions of the building

HIGH SCHOOL OF CRESCENT CITY, CALIF.

A good example of simple, effective architecture, achieved in concrete

HIGH SCHOOL, PALO ALTO, CALIF.

Concrete throughout

Concrete, plastic when placed, assumes the contour of the forms in which it is cast. By varying the outer faces of these forms, various shapes and contours are automatically produced in the finished concrete. Thus, by applying the age-old principle of all casting, decoration can be obtained wherever it is desired, without "tacking it on." Plaster molds, attached to the forms, are used for the more intricate types of decoration; for many others, simple carpentering suffices.

In certain jobs, where concrete of a different quality is desired in the decoration, pre-cast embellishment can be used. Incidentally, the making of "cast stone" units has become a highly specialized business, many instances of its output producing effects not otherwise attainable.

As for color, the possibilities in concrete are almost endless; for mineral pigment may be mixed with the concrete ingredients to produce hues and intensities of any quality, from the most delicate to the strongest. This integral coloration method depends on carefully controlled proportioning of cement and pigment and is usually best done under strict factory control; otherwise, variations in tone may occur.

Another method of obtaining color with concrete is the application of paints, stains and washes. Ordinary paint may be used, providing measures are taken to counteract the natural alkalinity of concrete. A number of special stains and cover-coats are produced and used successfully in the surface coloration of concrete.

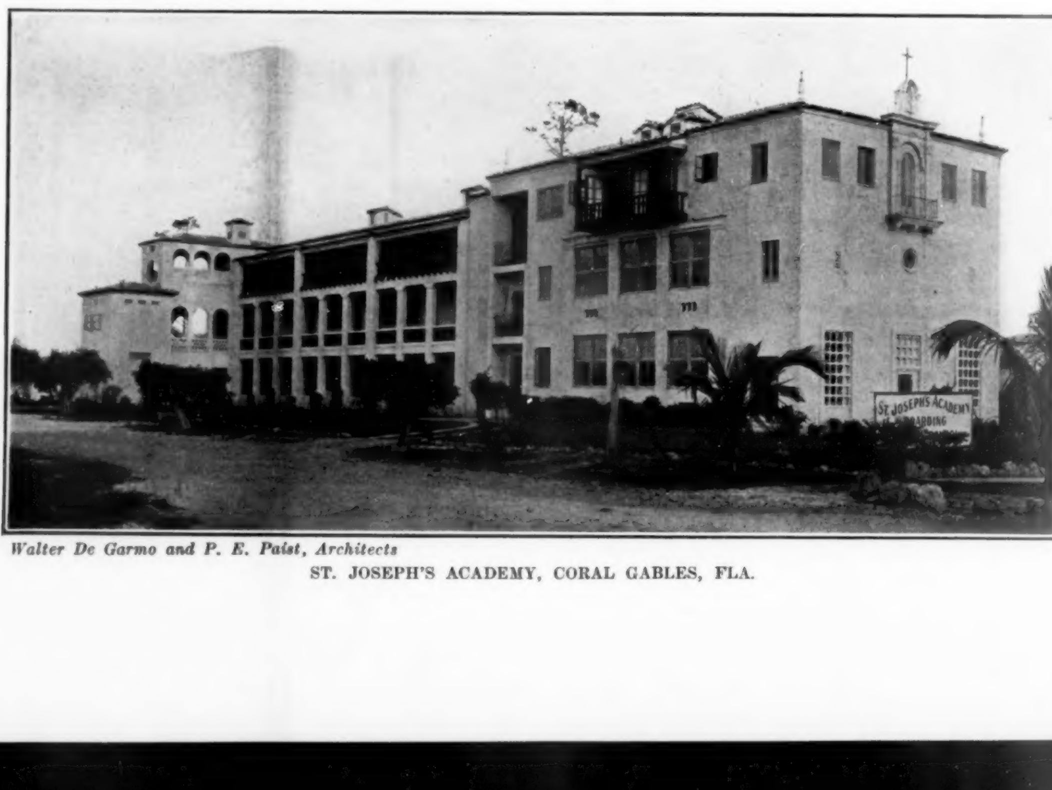
In many cases, architectural advantage is taken of the impressions left in a concrete wall by the lumber forms; this practice has been followed in some of the finest buildings on the Pacific coast. Or, the finished concrete may be variously treated to produce individual finish textures. Another finish is obtained by mechanical means, such as rotary grinders, hammers and polishers.

Theodore C. Link; Wogan & Bernard, Architects

LOUISIANA UNIVERSITY, BATON ROUGE, LA.

A thoroughgoing use of the structural and decorative qualities of concrete

Whatever method may be used, the result can be thoroughly satisfying—both to the architect and to the school. The architect has the satisfaction of seeing his designs realized in permanent, beautiful form; and the school wins a building of low cost, architectural merit, strength and safety. The lasting benefits of a building of this type are real; for the long-time costs are exceedingly low and the educational program of the community is given the advantage of a plant that is more than merely "adequate."



Walter De Garmo and P. E. Paist, Architects

ST. JOSEPH'S ACADEMY, CORAL GABLES, FLA.

Selecting a Site and Planning a Junior-Senior High School Building for a Growing Village

BY N. L. ENGELHARDT

PROFESSOR OF EDUCATION, TEACHERS COLLEGE, COLUMBIA UNIVERSITY

THE village of Rye is located on Long Island Sound, 24 miles from the Grand Central Terminal, New York City. It is primarily a residential community, with attractive surroundings and many beautiful homes. According to the New York State Census for 1925, Rye's population was 6,698. It has shown a considerable growth during the past two decades. Rye has grown rapidly, largely because of its proximity to the metropolis and the extensive development of highways and parkways by the Westchester County Park Commission. The Cross County Parkway and the Port Chester Parkway provide very important means of access to this community and link Rye more closely with New York City.

Rye is an incorporated village, with an area of six square miles, but it still has a survival of the rural school conditions which existed before its incorporation as a village. The community was originally divided into four different school districts, but now there are only two districts, namely, Number 2 and Number 3. These districts have, in the past, developed their own schools. District Number 3 carried its educational program from the kindergarten through the high school. The other district has its Milton Park School, in which only grades from the kindergarten through the ninth grade are taught. In 1928, the total enrollment in these schools was 1,121. These existing schools sufficed for a limited population, but the rapidity of growth in the community required that the two districts join in taking into consideration their common problems of providing a central junior-senior high school to care for the children of the sixth grade, and above, in the entire village.

After a series of community meetings in which the building problems, as well as problems of consolidation, were discussed by the residents of both districts, it was decided that a school-building survey and school population study of the entire village were necessary before a decision could be reached. The school boards of both districts agreed that such studies should be made. The result has been a complete report on the prospective growth and future school-building needs. This report[1] was made available to all the citizens of the community and formed the basis for the organization of a central high school district with a separate board of education.

The Rye High School District

The first problem confronting this central high school board of education was the selection of a site. This site is shown in Map 1, taken from the survey report. Community approval was required and secured for this site selection after all essential data were placed before the citizens.

This central high school board found itself in an unusual position. It had no educational faculty and no curriculum, but it had a scattered

[1] School Building Program for Rye, N. Y., by George D. Strayer and N. L. Engelhardt. Appears in N. L. Engelhardt's "School Building Programs in American Cities," Chapter X, pages 486-550. Bureau of Publications, Teachers College, Columbia University, 1928.

student enrolment which was constantly increasing and for whom provision had to be made.

Setting Up the Statement of Building Needs

The next problem confronting the Rye High School Board was that of setting up a complete statement of the spaces to be included in the high school, so that plans might be drawn and an estimate made of the size of the bond issue which would have to be voted by the people before further steps could be taken. A complete statement of the rooms to be included was prepared by members of the original survey staff. This statement is here given in the form in which it was finally presented to the architects. It will be noted that two schedules were prepared, namely, one for the ultimate school building and one for the present school-building needs.

STATEMENT OF THE SPACES TO BE INCLUDED IN THE CENTRAL HIGH SCHOOL OF RYE, N. Y.

The site selected for this school comprises approximately 20 acres lying between the Boston Post Road and the Milton Road. It is called the "Parsons Property." There will be planned on this site a six-year high school which will contain grades 7 to 12. It will be divided into two branches, namely, a junior and a senior high school. It may ultimately be necessary to provide on this same site other facilities either above or below the high school. This should be taken into consideration in the planning. The ultimate junior-senior population may reach as much as 1,500 to 2,000 students. In the original planning adequate attention should be paid to this ultimate need.

The site for this school presents an unusual opportunity for the development of an educational center. The site should be so planned that adequate provision is made for the play facilities needed in this combination type of school. The plan for the play facilities should include a football field surrounded by a quarter-mile track, with seating space for large groups for baseball, football and track, and a girls' play field of sufficient size to make it possible for groups of 100 to 200 girls to play hockey and indoor baseball, and to have their track meets. Provision should be made for volley-ball, tennis, and indoor basketball. If provision for skating can be arranged during the winter, that should be included. Many of the students will come to school in automobiles, and ample provision should be made for the parking of automobiles on the school grounds. Due consideration should also be given the parking of automobiles of those who attend school festivities or exercises of any kind.

When this school has reached a population of 1,500 students, the facilities outlined in Schedule I will be needed.

The First Building Unit

In Schedule II are found the provisions which will be needed for the first building unit. This unit is planned to provide for 700 junior-senior high school pupils. It should be borne in mind that the possibility of making extensions should be conserved for laboratories, for cafeteria, for physical education, for shops, and for classrooms.

SCHEDULE I

ACCOMMODATIONS FOR THE JUNIOR-SENIOR HIGH SCHOOL, RYE, N. Y.

The provisions to be included in the ultimate building. When this schedule has been completed, it will be well to consider another building on this same site.

Type of School

Junior-Senior High School providing for grades 7 to 12 inclusive, to accommodate 1,500 pupils.

Standard Classroom Unit

The standard classroom should be 23 feet wide, 26 feet long and 12 feet from finished floor to ceiling.

MAP 1, SHOWING THE LOCATION OF THE NEW JUNIOR-SENIOR HIGH SCHOOL, RYE, N. Y.

SCHEDULE OF ACCOMMODATIONS

Name	*Number of Such Rooms*	*Size (where possible expressed in standard classroom units)*
Regular Classrooms	30	23 x 26 x 12 ft.
Library		
Reading-rooms	2	2½ to 3 each
Workroom and storage	1	1
Classroom	1	1
Commercial Rooms		
Bookkeeping	2	1½ each
Typewriting and office practice	2	1½ each
(Shorthand taught in regular classrooms)		
Home Economics		
Food laboratory	2	1½ each
Model dining-room	1	½ each
Demonstration of household appliances and laundry	1	1
Clothing laboratory — fitting-room and storage	2	1½ each
Science Rooms		
General science and biology, including apparatus room and storage	3	2 each
Chemistry and physics, to include dark room and apparatus room.	2	2 each
Industrial Arts		
General shop—to include machine work—automobile—sheet metal.	1	3 to 4
Woodworking, tools, stock and finishing-room	1	3
Cafeteria and Study Hall		
Dining-room and study hall to accommodate 400; to increase to 600	1	10
1 kitchen and 2 serving counters	1	2
Drawing (1 for freehand; 1 for mechanical)	2	1½ each
Auditorium—main floor	1	To seat 750
Balcony		To seat 200
Stage (full width of auditorium)		30 to 35 ft. deep from proscenium arch
Picture booth on balcony		
Gymnasium		70 x 90 ft.
Locker room and showers for 750 boys		
Locker room and showers for 750 girls		
Offices for director of physical education and for woman assistant		
Seating with collapsible seats		
Girls' Gymnasium	1	50 x 70 ft.
Music Rooms (band, orchestra, and glee club)	3	100 people each
Music Library	1	1
Administration		
Principal's private office; 2 assistant principals' offices; Clerks and general public office; Vault; Toilet		2½
Teachers' Rooms		
Women teachers' room, one to include kitchenette, lockers and toilet	2	1 each
Men teachers' room, to include lockers and toilet	2	½ each
Workrooms or studies	6	½ each
Health Service Suite		
Physician's office; Nurse's room and waiting-room; Dressing-booths; Dentist's booths	1	2
Pupil Service Rooms		
Toilet rooms on each floor for boys and for girls		
Lockers—one for each pupil—in corridors		
Bicycle room (in basement)		
1 girls' rest room (23 x 26 ft.)		
Custodial Service Rooms		
Janitors' rooms and toilets for men and for women (in basement)		
2 slop sinks on each floor		
Storage space		
Receiving-room in basement		
Storage on each floor		
Boiler room		
Fuel storage		

SCHEDULE II

ACCOMMODATIONS FOR THE JUNIOR-SENIOR HIGH SCHOOL, RYE, N. Y.

Type of School

Junior-Senior High School providing for grades 7 to 12 inclusive, to accommodate 700 pupils in the first unit.

Provisions for Future Extensions

Plan the building as a completed structure, but in such a manner as to require a minimum of reconstruction or change as additional accommodations are required in extensions to be built.

Building Placement

Orientation—Face the building so as to secure a maximum number of classrooms lighted from the southeast, east, and west.

Position on site—Preserve maximum play space; allow for future additions.

Height in stories—Two or three stories (pipe space below floor).

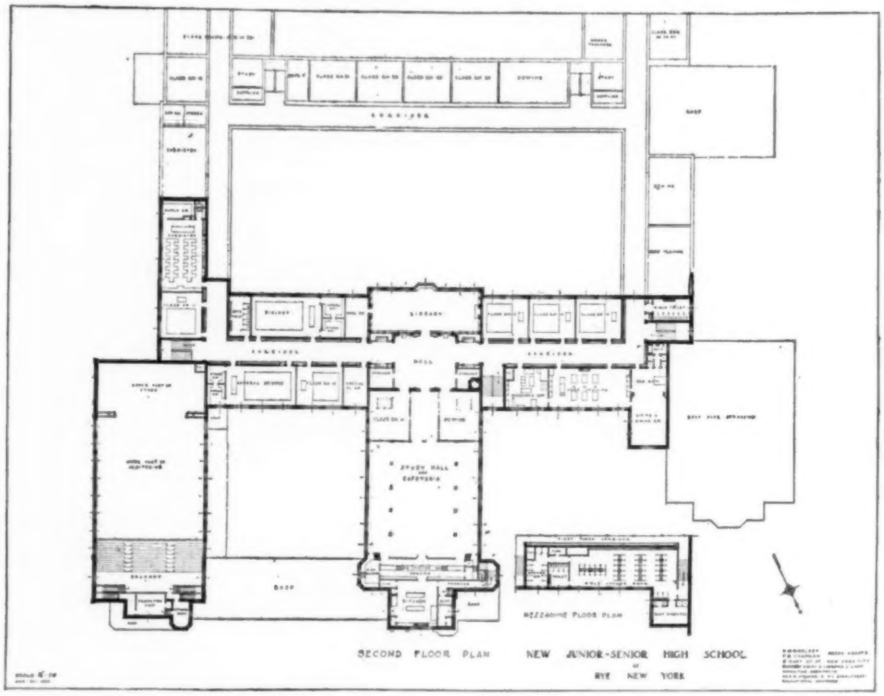
Basement for heating plant and storage only.

Standard Classroom Unit

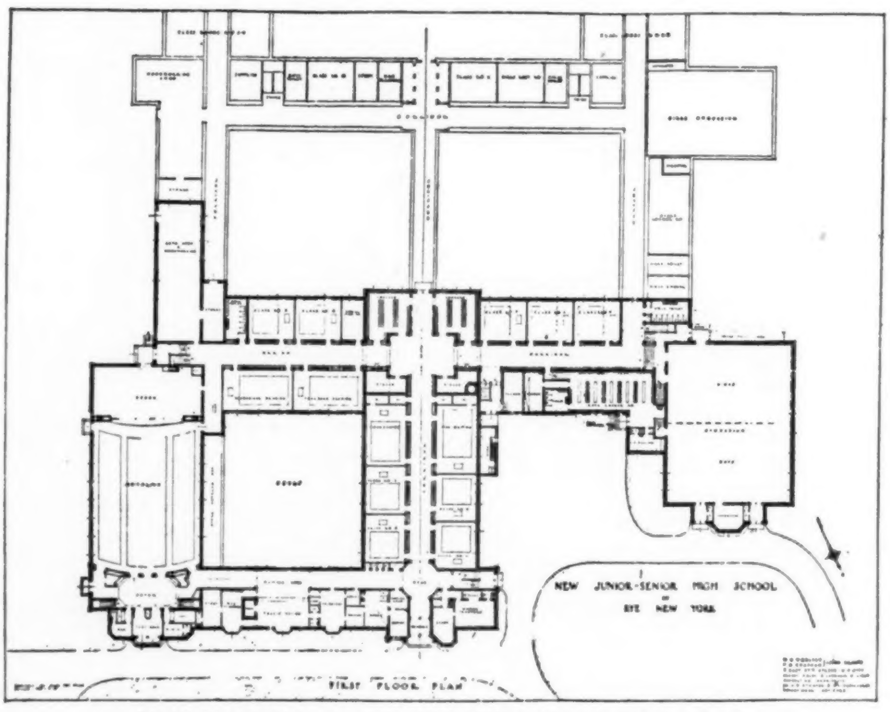
The standard classroom should be 23 feet wide, 26 feet long and 12 feet from finished floor to ceiling.

Name	*Number of Such Rooms*	*Size (where possible expressed in standard classroom units)*
Regular Classrooms	15	23 x 26 x 12 ft.
Library		
Reading-room	1	2½
Workroom and storage	1	½
Commercial Rooms		
Bookkeeping	1	1½
Typewriting and office practice	1	1½
(Shorthand taught in regular classrooms)		
Home Economics		
Cooking laboratory		1½
Model dining-room and bedroom		½
Demonstration of household appliances		1
Sewing-room, fitting-room and storage		1½
Drawing		
Freehand and mechanical combined until addition is built	1	1½
Science Rooms		
General science and biology, including apparatus room and storage.	2	2
Chemistry, to include dark room and apparatus room (also use for physics)	1	2
Industrial Arts		
General shop, to include machine work, automobile, sheet metal	1	3 to 4
Woodworking, tools, stock and finishing-room	1	3
Cafeteria and Study Hall		
Dining-room and study hall to accommodate 400	1	6
Kitchen and serving counters	1	2
Auditorium—Main Floor		To seat 750
Balcony		To seat 200
Stage (full width of auditorium).		30 to 35 ft. deep from proscenium arch
Picture booth on balcony		
Gymnasium	1	70 x 90 ft.
Locker * room and showers for 400 boys		
Locker * room and showers for 350 girls		
Offices for director of physical education and for woman assistant		
Music Room	1	100 people
Administration		
Principal's private office; Clerks and general public office; Vault; Toilet		1½
Teachers' Rooms		
Women teachers' room, to include kitchenette, lockers and toilet	1	½
Men teachers' room, to include lockers and toilet	1	½
Workrooms or studies	2	½ each

* Accommodations for school enrolment of 750, after which these accommodations should be consolidated for use of boys, and new girls' gymnasium built.



SECOND FLOOR PLAN OF THE NEW JUNIOR-SENIOR HIGH SCHOOL AT RYE, N. Y.



FIRST FLOOR PLAN OF THE NEW JUNIOR-SENIOR HIGH SCHOOL

Other features of the building are as follows:

Basement—Girls' and boys' dressing-rooms, storage space, plenum chamber, pump-room and hot-water tank, boiler room, switchboard room, janitor's room, men and women help's rooms, fuel space, stores and receiving-room

Third floor and roof—Deck roof, music room with stage and library, and storeroom

Name	*Number of Such Rooms*	*Size (where possible expressed in standard classroom units)*
Health Service Suite		
Physician's office; Nurse's room and waiting-room; Dressing-booths	1	1
Pupil Service Rooms		
Toilet rooms on each floor for boys and for girls		
Lockers—one for each pupil in corridors		
Bicycle rack in rear		
Custodial Service Rooms		
Janitors' rooms and toilets for men and for women in basement		
Slop-sinks on each floor		
Storage space		
Receiving-room in basement		
Storage on each floor		
Boiler room		
Fuel storage		

Selection of the Architectural and Planning Service

The Central High School Committee realized that this building was the most significant educational structure that had ever been planned for its community. The members of the committee were anxious to secure a building of harmonious design, of educational fitness and one to which the community would point with pride. Woolsey and Chapman, of New York City, were chosen as the architects; Sibley and Licht, of Palisade, N.J., as the architectural advisers; and Strayer and Engelhardt, New York City, as the educational advisers for the development of the plans.

Determining the Appropriation

After preliminary discussions and site appraisals, and the determination of the approximate cubature of the building, the sum of $1,100,000 was determined upon as being the approximate need for the development of this step of the program.

The Development of the Preliminary Plans

The three groups of planners, after many conferences and visitations to the site, secured solutions for problems that arose, in the following order:

1. The location of building and playground and athletic facilities with reference to the site was determined.

2. The locations of the large units so that they would become accessible to the public and available for community use, were also fixed.

3. The manner in which the building should be extended in the future was also determined.

4. The location of any other buildings upon the site which might be necessitated as Rye's population grows, was also fixed.

5. The character of the architecture and the general design were discussed and decisions made.

The results of these conferences were the preliminary plans, two of which are reproduced on page 94. The outstanding features of these plans are the community and student access to the auditorium and gymnasium, the possibility of student circulation, the centralized location of the administration and health units, the ease of expansion of science facilities, classroom facilities, physical education facilities and other separate departments of work, and the remoteness of music, shops and gymnasiums from classrooms so that there will be a minimum of interference from these sources in the educational program.

The Approval of the Preliminary Plans

Conferences held by the Central High School Board of Education with their working staff brought out the reactions of individual members of the school board to various aspects of the building planning, and resulted finally in the approval of the preliminary plans as shown in the diagrams.

The Next Steps

From this point on, there are involved the usual steps in planning and securing bids and in the award of contracts. The preliminary plans will be inspected by the State Department of Education, as will also the final working drawings and specifications. The board of education will also be required to see to the selection of a staff and the development and acceptance of a curriculum. The entire project affords a splendid illustration of the many problems involved where a new school district begins without any organization or any budget and proceeds to carry through to the erection of a building and the offering of a complete program in secondary education.

STANDARDS FOR SANITARY DRINKING FOUNTAINS

That there appears to be a lack of appreciation of the sanitary significance of certain features of the design of drinking fountains, as indicated by the too frequent installation of improperly designed units in schools and other public places, was pointed out by the Committee on Plumbing of the American Public Health Association in a progress report submitted to the Engineering Section of that organization at its annual convention in October, 1929. It was emphasized that the possibility of infectious diseases of the respiratory tract being transmitted by the use of insanitary drinking fountains has been demonstrated.

Excerpts from this report appear on the next page.

The full report was published in the November, 1929, number of the American Journal of Public Health, and is followed by a discussion of the report submitted to the convention by H. A. Whittaker, Director, Division of Sanitation, Minnesota Department of Public Health. The Minnesota regulations on drinking fountains will be found in The American City for May, 1929.

How Sanitary Drinking Fountains Should Be Made and Operated

CAREFUL consideration by the Committee on Plumbing of the American Public Health Association of requirements in the design, construction and operation of drinking fountains, whereby such structures may be in reality sanitary, indicates that the following details should be considered:

1. The fountain should be constructed of impervious material, such as vitreous china, porcelain, enameled cast iron, other metals, or stoneware.
2. The jet of the fountains should issue from a nozzle of non-oxidizing, impervious material set at an angle from the vertical, and at an elevation above the edge of the bowl, so that the end of the nozzle will not be flooded in case a drain from the bowl of the fountain becomes clogged.
3. The end of the nozzle should be protected by non-oxidizing guards to prevent the mouth or nose of persons using the fountain from coming into contact with the nozzle.
4. The inclined jet of water issuing from the nozzle should not touch the guard, thereby causing spattering.
5. The bowl of the fountain should be so designed and proportioned as to be free from corners which would be difficult to clean or which would collect dirt.
6. The bowl should be so proportioned as to prevent unnecessary splashing at a point where the jet falls into the bowl. Self-cleansing anti-splash rims are recommended.
7. The drain from the fountain should be connected to a separate waste pipe.
8. The water-supply pipe should be provided with an adjustable valve fitted with a loose key or an automatic valve permitting the regulation of the rate of flow of water to the fountain so that the valve manipulated by the users of the fountain will merely turn the water on or off.
9. The control valve should be operated preferably by knee or foot action to avoid possible hand contamination.
10. The height of the fountain at the drinking level should be such as to be most convenient to persons utilizing the fountain. The provision of several step-like elevations to the floor at fountains will permit children of various ages to utilize the fountain. Elevations may be difficult to provide, however, at fountains recessed in walls.
11. The rate of flow and the pressure should be such that the water will not splash over the bowl. It should be at a rate not less than ½-gallon per minute and at nozzle pressure not exceeding 5 pounds per square inch.
12. The waste opening and pipe should be of sufficient size to carry off the water promptly. The opening should be provided with a strainer.

Obviously, the control and supervision of public drinking fountains should be delegated to local health authorities. It is the Committee's impression that few local ordinances on this subject have been promulgated. In certain instances, however, boards of education have specified in their building standards what types of drinking fountains must be installed in approved school buildings.

The Committee report also calls attention to the fact that the use of sanitary drinking fountains involves several secondary problems, such as location, water-supply, and cooling. On these subjects the report says:

"It would seem a relatively simple matter to locate drinking fountains properly, and yet such fountains have been observed in toilet rooms, vestibules, and baggage rooms, and isolated in improperly lighted hallways. It is not felt that the mere location of a drinking fountain is of great sanitary significance; yet it is apparent that the education of the public in matters of cleanliness and hygiene will be hindered by the inference drawn from observing such structures in toilet rooms or similar locations. Esthetic considerations must be considered likewise.

"It goes without saying that the water obtainable through drinking fountains should be of satisfactory sanitary quality. The pressure of the supply is also of considerable importance, because if the pressure is insufficient, the rate of flow of the water is too slow to produce the desired size jet, making it difficult to secure water. This deficiency may be caused by undue resistance to the flow of water by the jet and control valve of the structure, or to low pressure on the distribution system. If the pressure is too high, the jet is too strong and water is splashed over those using the fountain. If, on the other hand, the pressure is insufficient, the jet may not reach the proper height and there will be a tendency for those desiring water, especially children, to secure it by placing their hands or small utensils in the bowl of the fountain. Frequently valves are provided on fountains for adjusting the rates of flow, to provide the desired size jet. Automatic pressure control valves are preferable, if not necessary, with slanting jet fountains, as the pressure of the water-supply varies throughout the day.

"Drinking fountains are also subject to limitation imposed by the necessity of cooling a relatively large volume of water, because warm water is not attractive to the public. The quantity of water flowing through a drinking fountain is much in excess of that which would be used were individual drinking cups available, so, obviously, the amount of ice necessary to cool the water issuing from drinking fountains is greater than otherwise would be the case. It is felt that this feature is one of the salient reasons why drinking fountains are not so popular with the public as they were expected to be by those interested in providing sanitary means of securing potable water. Mechanical refrigerating equipment is available, however, for cooling the water. The cost of such installations is about twice that of equipment for cooling with ice. Many of these units, therefore, are being installed. Sulphur dioxide and other gases are being used as the refrigerating agents.

"It should be emphasized that the design of this equipment should be such that the gas will not enter the water-supply of fountains in case of leaks; otherwise sulphurous acid or other compounds would be formed in the water. Obviously, the fountains and refrigerating equipment should be designed and installed in such a manner that cross-connections are not formed between the water-supply and drainage systems."

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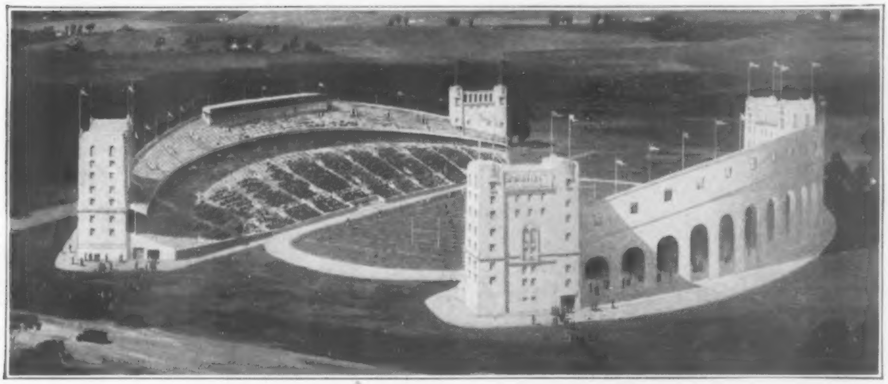
PLUMBING EQUIPMENT



NORTHWESTERN UNIVERSITY STADIUM

What Constitutes Good Plumbing Equipment?

This is one of the important questions which school boards must decide when they are considering building or remodeling. Plumbing equipment used in homes and public buildings may be used for schools when similar conditions exist, but when conditions differ, equipment should be used which has been proved satisfactory under identical conditions.

Progressive school boards throughout the country are installing Crane Plumbing. Crane Co., through its many years of experience in the school field, has developed special plumbing fixtures which function efficiently and unobtrusively. Crane knowledge gained over 75 years means quality that is apparent in even a casual inspection of the finished materials.

In most of its 194 branches scattered throughout the world, Crane Co. maintains display rooms where the most complete and modern equipment is on exhibit. There you will find a cordial welcome and experienced Crane representatives to serve you.

C 13002-VB
"Water Controlled Vacuum Breaker" Flush Valve

A Discovery of Importance to School Sanitation

Dr. Arnold H. Kegel, Commissioner of Health, City of Chicago, with the cooperation of Crane Co. has proved that under certain conditions it is possible to pollute the water supply of a building by the siphonage of the water from closet bowls. In an exhibit of Crane plumbing fixtures at the American College of Surgeons' convention in Chicago, Dr. Kegel demonstrated the manner in which this back-siphonage occurs. It is caused by the creation of a vacuum in the supply piping.

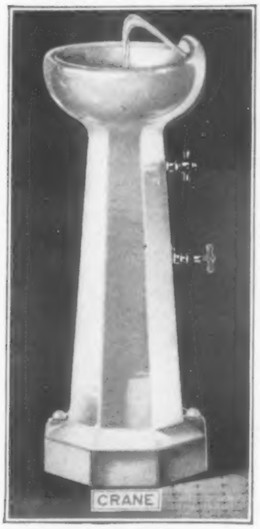
Crane Co. immediately developed a means of eliminating any possibility of infection from this condition. Illustrated above is a Crane water controlled direct closet flushing valve equipped with vacuum breaker. Should a vacuum occur in the supply line, air in sufficient quantity to prevent back-siphonage of polluted water from the closet bowl is admitted into the supply line.

Where large groups of people are gathered in one building, using the same plumbing equipment it is obvious that the utmost care is necessary to prevent epidemics of disease. Crane Co. is deeply aware of its responsibility in safeguarding health and is always anxious to aid in the development of better sanitation.

A Few

CRANE

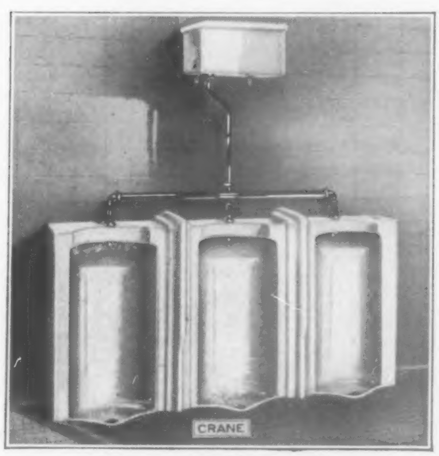
Plumbing Fixtures



C 9030-A
TYRONE Drinking Fountain

C 10050
WALSYN Wall Closet

C 598-88
IPSWICH China Laboratory On Leg



C 15550
Porcelain (All Clay) Urinals

Crane Co. has recently prepared a 60-page booklet, **Plumbing Equipment for Educational Institutions** which is devoted to school plumbing requirements and which will be gladly mailed upon request. Write for your copy.

AUSTRAL WINDOW COMPANY

101 Park Avenue, NEW YORK, N. Y.

The AUSTRAL WINDOW affords a perfect system of ventilation, without direct draft—without expensive or complicated equipment or operating costs. Even though other systems of ventilation are installed, the AUSTRAL WINDOW may be relied upon to furnish adequate ventilation during the greater part of the school period.

Light is regulated and controlled by the arrangement of Shades on Sash. Free circulation of air is not obstructed. An ideal awning effect is produced without the usual expense and inconvenience.

The Upper and Lower Sash are both reversible for Cleaning and Glazing—a great saving in labor.

Heavy Sash operate as easily as a well-hung door and openings may be regulated as desired. This feature is an AUSTRAL characteristic.

Additional light space is secured by the use of AUSTRAL Plank Frames.

AUSTRAL Mullions are about one-half the size of mullions required for double-hung windows.

AUSTRAL BALANCE ARMS eliminate the use of box frames, chains, weights and pulleys.

AUSTRAL WINDOWS are also built of heavy two-point contact steel casement sections which insure perfect weathering, at minimum cost.

Wood AUSTRAL Windows lend themselves readily to Weather-Stripping, and may, without affecting the operation of the Sash in the slightest degree, be made tighter than the ordinary double-hung window, weather-stripped.

Details, specifications and full particulars are contained in our School Catalogues which will be sent upon request.

On the opposite page appear representative schools by eminent architects who have adopted the AUSTRAL Window as **"Standard School Equipment."**

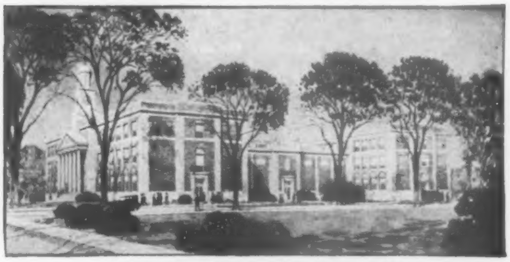
Showing a group of AUSTRAL WINDOWS installed in a Kindergarten at Worcester, Mass. Although these windows appear to be closed, they are, as a matter of fact, open from 12 to 15 inches at the center, deflecting the incoming air up into the center of the room, giving perfect ventilation with no danger of draft.

SHENANDOAH JUNIOR HIGH SCHOOL, MIAMI, FLA.
August Geiger, Architect

HIGH SCHOOL, FARGO, N. D.
William B. Ittner, Architect

NATHANIEL HAWTHORNE HIGH SCHOOL, YONKERS, N. Y.
G. Howard Chamberlin, Architect

TUSCAN SCHOOL, MAPLEWOOD, N. J.
Guilbert & Betelle, Architects



HIGH SCHOOL, RUTLAND, VT.
Tooker & Marsh, Architects

LYONS TOWNSHIP HIGH SCHOOL, LA GRANGE, ILL.
Joseph C. Llewellyn & Co., Architects

CENTRAL HIGH SCHOOL DISTRICTS 5, 16, 17, 22, LONG ISLAND, N. Y.
Knappe & Morris, Architects

SENIOR HIGH SCHOOL FOR GIRLS, ATLANTA, GA.
Edwards & Sayward, Architects

BLABON-SANDURA COMPANY, INC.

Finance Building, Philadelphia, Pa.

BRANCHES

New York, N. Y. Boston, Mass. Chicago, Ill.

Products

Blabon's "Invincible" Battleship Linoleum.
Wild's Battleship Linoleum.
Blabon's and Wild's Plain Linoleum.
Blabon's and Wild's Cork Carpet.
Blabon's and Wild's Jaspé Linoleum.
Blabon's Inlaid Linoleum: Marble, Tile, Straight Line, Jagged Stone, Moulded.

BLABON'S New Type Inlaid and Battleship Linoleum

Since June 20th, 1928, all grades of Blabon's Inlaid Linoleum have been processed with the highest grade, non-cracking lacquer, which is applied in such a manner that it hermetically seals the dirt-absorbing pores of the linoleum, after which a thick coat of wax is applied to the surface.

A Finished Floor When Installed—Blabon's Inlaid Linoleum, being both processed with lacquer and surface-waxed, is ready to install as a **finished floor.** In this age, when the question of labor involved in any operation is of vital importance, this improved feature in Blabon's Inlaid Linoleum is greatly appreciated by all. Blabon's Battleship Linoleum can now be supplied either lacquer-processed and waxed or with standard finish.

Advantages of Linoleum Floors

Many weighty reasons support the assertion that linoleum is the ideal flooring for office buildings, schools, theaters, club and lodge buildings, libraries, hotels, churches, banks, stores and other commercial, public and semi-public buildings. For all uses where traffic is exceptionally heavy, the "battleship" grades of linoleum are recommended. Because of thickness of material, they make the most durable and most comfortable linoleum floors that can be installed.

The principal advantages of linoleum as a flooring are:

1. **Serves as Floor and Floor Covering in One**—Where linoleum is used over concrete as a flooring, in place of wood, tile or some other material, it becomes unnecessary to use rugs or carpets. Because of its quietness, resilience and comfort to the tread, linoleum serves both as floor and floor covering.

It is particularly advantageous where persons are compelled to stand for long hours.

BLABON'S "INVINCIBLE" BATTLESHIP LINOLEUM
Pliable, Tough and Wear-resisting Bends Without Breaking

2. **Durability**—A floor of Blabon's "Invincible" Battleship Linoleum will wear for many years. In fact, its durability is such that if properly laid and given proper care it will wear indefinitely.

3. **Sanitation**—A linoleum floor is sanitary, because it has a non-absorbent surface through which dust and dirt can not penetrate; and because, when properly laid, its almost invisible joints are likewise practically sealed against such penetration.

Further, a well-known European chemist has established by original researches that the linseed oil in linoleum yields certain acid gases which destroy the bacterial germs that inhabit other floors and floor coverings.

4. **Economy**—Considering its durability, linoleum is the most economical floor-covering known, especially for places where it is subjected to unusually hard wear. Measured on the basis of cost-per-years-of-service, there is no other type of floor that can compare favorably with linoleum in this respect. Linoleum floors never require refinishing, but merely an occasional waxing and polishing.

5. **Easy td Clean**—Linoleum does not require constant scrubbing. The only necessary daily treatment is a light sweeping, or wiping with a damp mop or cloth.

6. **Suitable for Fireproof Construction**—Linoleum is less susceptible to fire than wood floors and it is a well-known fact that it will not burn near so rapidly as wood. In fact, some fire insurance companies place linoleum in the same classification with ceramic tile. The fire hazard with linoleum, laid directly on concrete is practically nil.

7. **Artistic and Decorative Values**—Linoleum, as made today, is worthy of the architect's and decorator's consideration from the artistic viewpoint, as well as the practical.

Because of their beauty and distinctiveness, a greatly increasing number of linoleum floors are being laid with borders of plain or jaspé linoleum in harmonizing or contrasting colors. The artistic possibilities of these border effects are so striking and so varied that we especially recommend them.

Linoleum Designs and Colors

6 M/M and Light (1/8 in.) Battleship Linoleum comes in brown, gray and green, 3/16 in. in brown, gray, green and black.

Plain Linoleum is made in A, B and C gauges in brown, gray, green, blue and black, while D gauge is made in brown, gray, green and black only.

Jaspé Linoleum is made in A and B gauges in brown, gray and apple green. 3/16 in. jaspé in brown and gray only.

All Blabon's "Invincible" Battleship and Plain Linoleums are made by the famous Walton process, and in accordance with the rigid specifications of the United States Government. In fact, they are made even better than demanded by these specifications.

Cork Carpet

This product, which is made especially for use in churches, theaters, public libraries, and other places where a soft, silent, springy floor is desired, deserves special mention here. Cork Carpet contains the same ingredients and is manufactured by the same process as a high grade of plain linoleum, but the cork composition is pressed less compactly on the burlap foundation and for this reason cork carpet retains greater resilience than linoleum, yet it is a highly durable material.

Where BLABON'S Linoleum Can Be Obtained

Blabon's Linoleum is sold throughout the country by department stores, house-furnishing and floor-covering establishments, and in nearly all important cities by specialty linoleum contractors. We will gladly furnish names of reliable handlers in the larger centers.

Service Bureau for Architects and Contractors

This Bureau is entirely at your service without obligations, for the purposes of—recommending grades and thicknesses of Blabon's Linoleum best suited to specific conditions, furnishing technical data on the installation and care of linoleum floors, or writing specimen specifications. This department will also recommend competent laying organizations for the complete installation of linoleum floors by approved methods.

Cleaning and Preserving Method

The life of linoleum will be greatly prolonged and the freshness and brightness of its color indefinitely preserved if it is washed or scrubbed with lukewarm water and a good soap containing no free alkali. Always avoid strong scouring soaps or quick-cleaning preparations as they are injurious to linoleum. A list of approved soaps, cleansers, etc., will be sent on request.

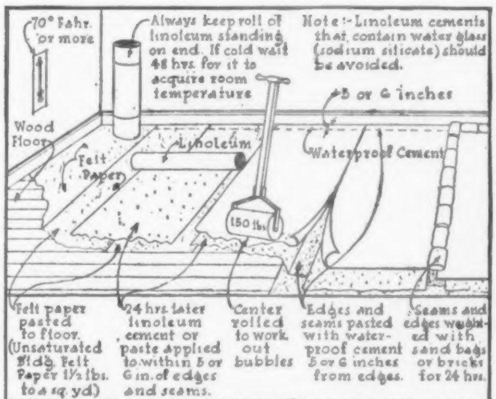
The beauty and wearing qualities of Inlaid, Jaspé or Plain Linoleum will be materially benefited by an occasional polishing with Blabon's Liquid Wax or any high grade floor wax.

Pattern Book, Quality Samples, Etc.

We have helpful booklets, folders, and quality samples, that our Service Bureau will cheerfully send (upon request) to architects, builders, decorators and linoleum contractors. The Blabon Pocket Size Pattern Book, showing all patterns in colors, and a large box of quality samples, containing specimens of various grades of Blabon's Linoleum, should be in every architect's and school superintendent's files.

Approved Method for Installing Linoleum Over Felt Lining

In the following diagram you will note the method we recommend for laying linoleum.



METHOD OF LAYING LINOLEUM OVER FELT PAPER

CONGOLEUM-NAIRN INC.

Manufacturers of **Materials for**

BONDED FLOORS

Sealex Linoleum and Tile *Backed by a Guaranty Bond*

General Office: Kearny, New Jersey

CONGOLEUM-NAIRN INC. is the largest manufacturer of smooth-surfaced floor-coverings in the world. Its products are regarded as the finest of their kind and

This floor shows the adaptability and decorative value of Sealex materials. A specially designed floor of Sealex Treadlite Tile repeats the intricate motif in the ceiling panel above it.

are used in enormous quantities in schools, colleges, universities, hospitals, libraries and other public and private buildings.

For forty years the Congoleum-Nairn line of linoleums has represented the highest standards of quality. Exclusive developments in manufacturing processes have resulted in the utmost perfection of finish, great flexibility, unusual resilience and durability, and unmatched ease of cleaning.

Sealex Linoleums take their name from the exclusive Sealex Process, developed and perfected by our technical experts. One important effect of this unique method of manufacture is to penetrate the tiny, dirt-absorbing pores, giving to Sealex materials practical qualities never before possessed by linoleum.

Dirt cannot grind into Sealex floors as into ordinary linoleum. Greases and liquids cannot penetrate them. Even hot fats, fruit juices, ink, etc., can be easily removed without leaving damaging spots or stains. Cleaning is easily accomplished with a mop or push broom. Hard rubbing and scrubbing, and expensive, powerful cleaning agents are not needed—painting, varnishing or refinishing are never necessary.

Easier cleaning and reduced mainte-

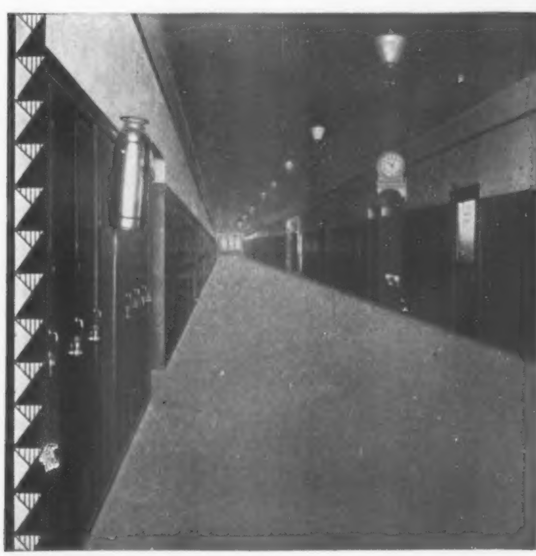
Units of any shape or size may be cut out of different colored pieces of Sealex Linoleum and inset into the main body of the floor—thus providing attractive, permanent markers for games, class formation, etc.

nance costs, however, are not the only advantages of Sealex materials. They wear longer, too, and their colors have depth and softness, with no suggestion of glossy slipperiness.

Sealex Linoleum and Sealex Treadlite Tile offer other practical virtues which make them ideal for school installation. These resilient cork-composition materials provide insulation against sound, heat and cold. They are quiet and comfortable underfoot—shock-absorbing, noise-absorbing. They provide a smooth, sanitary, nonslippery surface which will not crack, chip or splinter.

As for wearing qualities, the durability of a Sealex floor is simply a matter of the thickness of the material used. Our heavier linoleums, installed in locations where traffic has been hard and constant, are still on the job, in good condition, after many years of service.

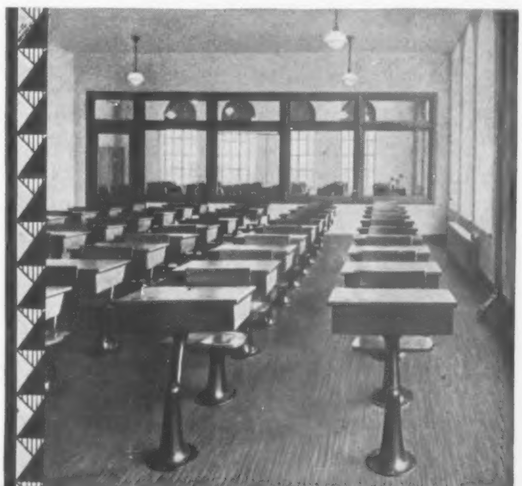
Sealex Linoleums are available in such a wide range of colors and "ready-made" patterns, that it is a simple matter to select a material which is nicely suited to the purpose, scale and decorative scheme of any interior.



Solid-colored Sealex Battleship Linoleum makes corridors quiet, comfortable and easy to clean at surprisingly low cost. Remember, dirt will not grind into these spot-proof, stain-proof floors.

If special de luxe patterns and original decorative effects are desired, it is an easy matter to cut them from Sealex Linoleum and Sealex Treadlite Tile. The small additional cost of these custom-made floors is more than compensated for by their distinctiveness.

Sealex floors may be installed in any building either as part of the original equipment or over the present wood, cement or stone floors.



Sealex Jaspé Linoleum has an attractive two-toned graining which is quite pleasing. Obtainable in a variety of colors, it adds cheer and "decoration" at no sacrifice of practical advantages.

Our competent, nation-wide flooring service gives valuable assistance in selecting suitable materials; designs floors; installs them—in short, takes care of every detail for you. Write us for any information on the subject of school floors—no obligation, of course.

BONDED FLOORS

Bonded Floors are floors of Sealex Linoleum and Sealex Treadlite Tile, backed by a Guaranty Bond issued by the U. S. Fidelity and Guaranty Co. Authorized Contractors of Bonded Floors are located in principal cities.

DAHLSTROM METALLIC DOOR COMPANY

Established 1904

469 Buffalo Street, Jamestown, N. Y.

FACTORIES

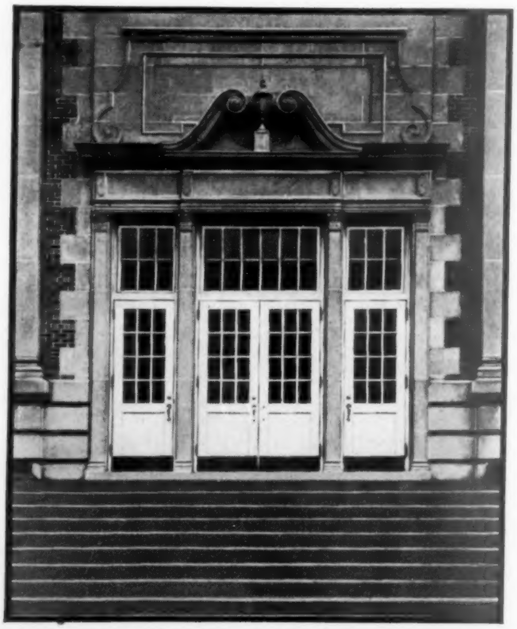
Jamestown, N. Y., and Los Angeles, Calif.

OFFICES IN ALL PRINCIPAL CITIES

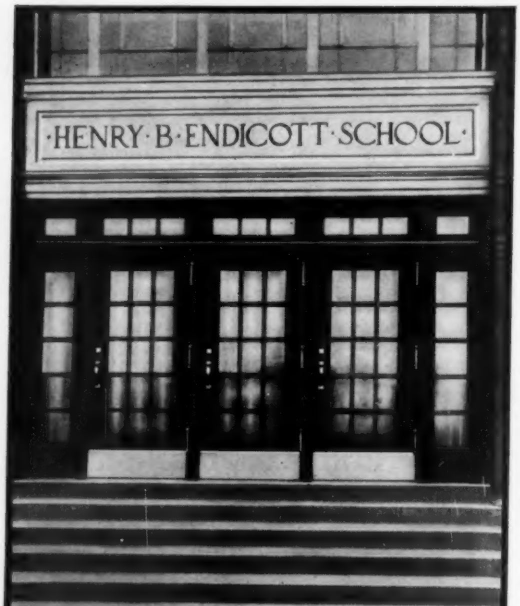
Makers of

Hollow Metal Swing Doors, Elevator Entrances, Smoke Screens, Trim and Partitions

What is more impressive about the appearance of the modern school building than the inviting and inspiring beauty of its entrance doors? With the increasing use of Dahlstrom Hollow Metal Doors in school buildings, the entrances take on a new beauty, but they are also giving to that building an enduring service that requires little cost for upkeep or maintenance. Dahlstrom Hollow Metal Doors, beneath the beauty of their fine finish and delightful design, also serve to protect the building they enhance. For aside from the beauty factor, they are of paramount importance to a school building as a fire resistant. No school, hospital or office building Dahlstrom equipped has ever suffered a huge fire loss. It is a constant tribute to the founder of this industry, Mr. Dahlstrom, that the Hollow Metal Door he devised and patented more than twenty-six years ago, finds such enthusiastic popularity among School Architects. The illustrations on these pages show typical installations in different school buildings.



DAHLSTROM HOLLOW METAL ENTRANCE DOORS WERE INSTALLED IN THE BENJAMIN FRANKLIN SCHOOL, IN BINGHAMTON, NEW YORK



DAHLSTROM HOLLOW METAL ENTRANCE DOORS SHOWN, WERE INSTALLED IN THE HENRY B. ENDICOTT SCHOOL, ENDICOTT, N. Y.

DAHLSTROM HOLLOW METAL SMOKE SCREENS

In addition to the Hollow Metal Entrance and Swing Doors, Dahlstrom has perfected the Hollow Metal Smoke Screens for school construction.

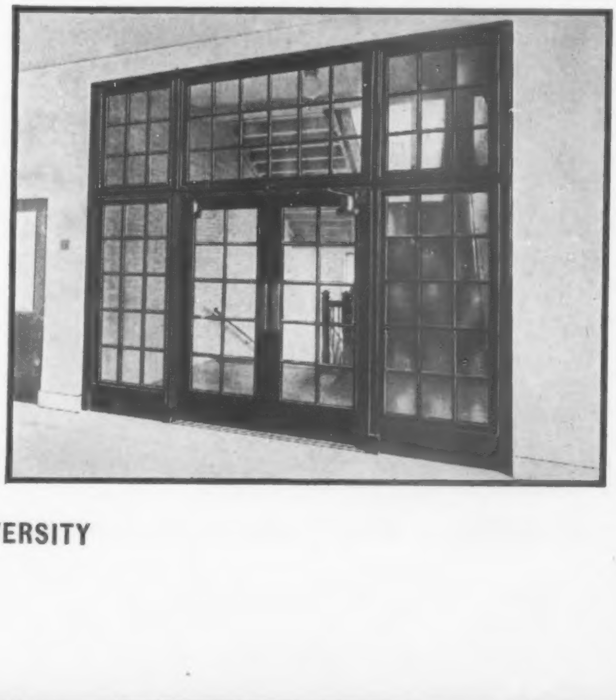
The vital importance of this fire protection unit in the modern school building is generally recognized. It is a source of pride that the development of this Hollow Metal Smoke Screen was made possible through Mr. Dahlstrom's patented hollow metal door design. The wide use of Dahlstrom Smoke Screens in modern school buildings reflects the appreciation of school architects of the part Dahlstrom played in making the Hollow Metal Smoke Screen possible. Since public interest in the welfare of school children is always present, particularly in regard to the proper protection against the fear of fire hazards, the first duty of any individual or group entrusted with the planning of school buildings should be to specify Hollow Metal Smoke Screens.

Since its inception, users have been highly enthusiastic about the beauty and simplicity of its appearance, and the practicability of its work as a firecheck. By guarding the stairways and corridor entrances, Dahlstrom Hollow Metal Smoke Screens confine the fire to its origin and prevent its spread from floor to floor. Illustrated below is a typical Dahlstrom Smoke Screen. For those who are interested, more detailed information and illustrations of recent installations are available.

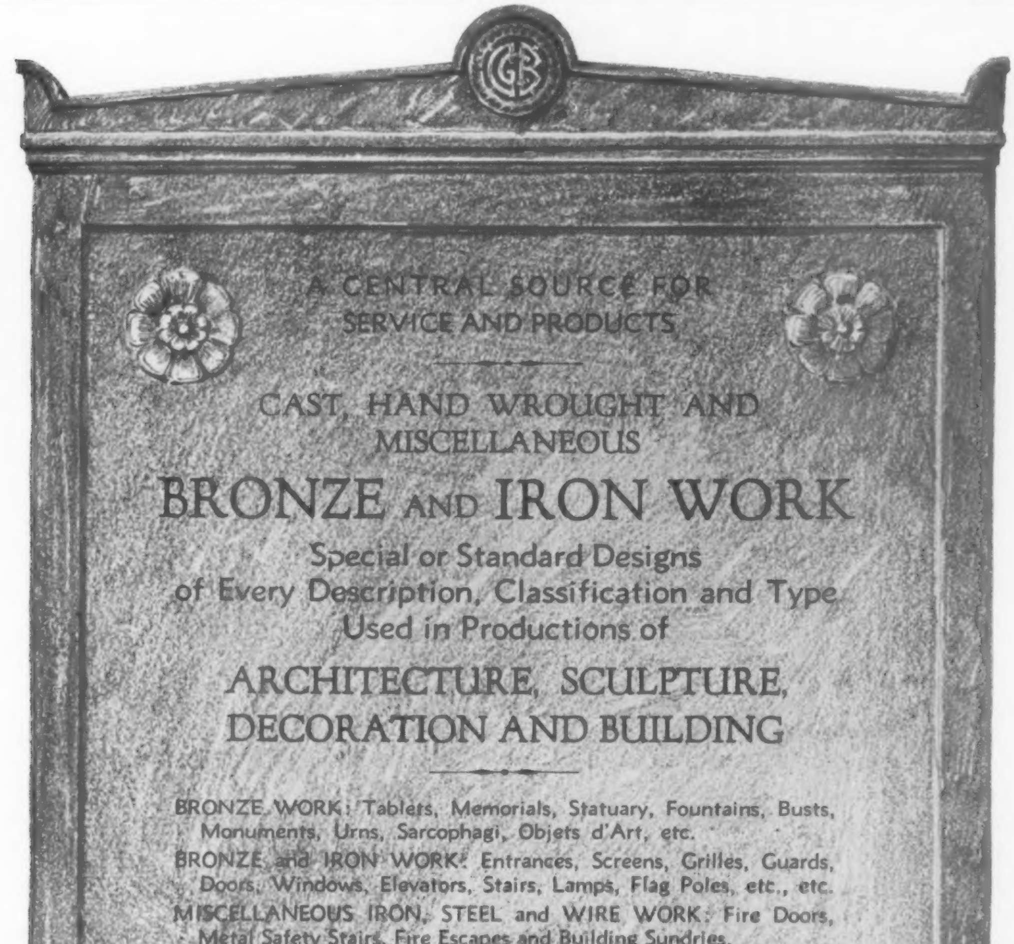
With the largest facilities in the world devoted exclusively to the manufacture of Hollow Metal Products, Dahlstrom invites your inquiry regarding Hollow Metal Entrances and Swing Doors, Elevator Entrances, Smoke Screen, Trim and Partition.

DAHLSTROM HOLLOW METAL ENTRANCE DOOR WAS INSTALLED IN THE BAKER CHEMICAL LABORATORY, ITHACA, N. Y.

"No building is more fireproof than its doors and trim."—Dahlstrom.



DAHLSTROM HOLLOW METAL SMOKE SCREEN SHOWN WAS INSTALLED IN THE COVENTRY SCHOOL, CLEVELAND, OHIO


A CENTRAL SOURCE FOR
SERVICE AND PRODUCTS
CAST, HAND WROUGHT AND
MISCELLANEOUS
BRONZE AND IRON WORK
Special or Standard Designs
of Every Description, Classification and Type
Used in Productions of
ARCHITECTURE, SCULPTURE,
DECORATION AND BUILDING
BRONZE WORK: Tablets, Memorials, Statuary, Fountains, Busts, Monuments, Urns, Sarcophagi, Objets d'Art, etc.
BRONZE and IRON WORK: Entrances, Screens, Grilles, Guards, Doors, Windows, Elevators, Stairs, Lamps, Flag Poles, etc., etc.
MISCELLANEOUS IRON, STEEL and WIRE WORK: Fire Doors, Metal Safety Stairs, Fire Escapes and Building Sundries.
MANUFACTURED BY
John Polachek Bronze & Iron Plant
Tiffany Studio Bronze & Iron Plant
Renaissance Bronze & Iron Plant
American Art Foundry Plant
Roman Bronze Works Statuary Plant
Flour City Ornamental Iron Plant
Wisconsin Ornamental Bronze Plant
The Guaranty Iron & Steel Plant
Guarsteel Safety Stair Plant
The Dominion Bronze & Iron Plant
Fifty-Sixth Street Galleries, Art Show Rooms and Sculpture Center of America
6 East 56th Street, New York
DIVISIONS OF
GENERAL BRONZE CORPORATION
LONG ISLAND CITY
NEW YORK

GRAYBAR ELECTRIC COMPANY

Executive Office: Graybar Building, Lexington Ave. and 43rd Street

New York, N. Y.

GraybaR
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Cleveland, Ohio
Columbus, Ohio
Dallas, Texas
Davenport, Iowa
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Grand Rapids, Mich.
Hammond, Ind.
Harrisburg, Pa.
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Kansas City, Mo.
Knoxville, Tenn.
Los Angeles, Calif.
Louisville, Ky.
Memphis, Tenn.
Miami, Fla.

Milwaukee, Wis.
Minneapolis, Minn.
Mt. Vernon, N. Y.
Nashville, Tenn.
New Haven, Conn.
New Orleans, La.
New York, N. Y.
Newark, N. J.
Norfolk, Va.
Oakland, Calif.
Oklahoma City, Okla.
Omaha, Nebr.
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Tacoma, Wash.
Tampa, Fla.
Toledo, Ohio
Trenton, N. J.
Washington, D. C.
Wichita, Kan.
Worcester, Mass.
Youngstown, Ohio

Graybar Inter-Phones

The best practice in educational construction work recognizes the importance of a swift and dependable interior telephone system.

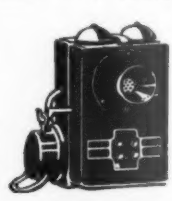
Leading architects engaged in planning new school and college buildings consider Inter-Phones an essential part of the design and equipment. School boards very definitely appreciate the importance of this telephone system that knits all the individuals of the teaching staff together—without, at the same time, requiring the services of an operator.

CRADLE HAND SET

Coupled with their extreme simplicity — the user merely pushes a button to make the desired connection—Graybar Inter-Phones are reliable in the extreme. Associated with them is over a half century of experience in the supplying of telephones and telephone equipment. In addition to this, the longest record of service in the field of sound transmission, are the high precision standards to which Graybar Inter-Phones are built and tested.

ITS RECORD

The most conclusive proof of the high quality of Graybar Inter-Phones is their performance in actual service. Inter-Phones have been installed in all kinds of schools and colleges from coast to coast, rendering in every case satisfactory service.



WALL TYPE

Inter-Phones are made in various styles to meet a wide variety of requirements. On this page are shown two such styles.

One is the wall type; the other is the cradle hand set type.

The selection of the proper type of Inter-Phone is considerably simplified by the large amount of information and experience records available. Graybar Inter-Phone specialists will be glad to place this material at the disposal of architects and school boards.

LIGHTING

That which in commmercial fields is largely a financial consideration becomes sometimes in educational work, a matter of serious importance bearing on the physical and mental progress of many individuals.

THE LINCREST

Proper lighting, in schools, is a great factor in conserving the eyesight of youth and in accelerating the rate of progress of the student.

Approached from that angle, Graybar's complete line of scientifically designed lighting units assumes considerable significance.

Foremost among these is the Graybar Shelcrest. Here is a distinct advance in lighting fixture practice. To begin with, its stem is entirely of Bakelite, which, aside from the practical consideration of extreme ease of cleaning, gives the entire unit that conspicuous warmth, richness and trimness of finish characteristic of this material. The stem comes in sections, permitting ease and flexibility of installation. The globe is held by a patented safety device.

Another popular Graybar lighting unit is the Lincrest. This fixture, also a safety type, combines simple beauty of design, correct electrical and illumination characteristics and highest grade of material and workmanship.

Among other types of Graybar lighting units are the Stancrest (which varies from the Lincrest chiefly in that the globe is held by set screws) and the Faircrest (an even more economical unit, typical in every way of Graybar quality).

All these units are available with the famous "99" or "66" glass, or with special glass to suit individual requirements.

THE SHELCREST

MANY SUCCESSFUL INSTALLATIONS

Among the many successful installations of Graybar lighting units are the following:

Kansas City School	Kansas City, Mo.
Frazier School	Atlanta, Ga.
William Ruffner School	Norfolk, Va.
Eau Claire High School	Eau Claire, Wis.
City Schools	Gary, Ind.
Belmont School	Dayton, Ohio
Park City School	Knoxville, Tenn.
Garfield High School	Johnstown, Pa.
Marquette University	Milwaukee, Wis.
University of Wisconsin	Madison, Wis.
Virginia Polytechnic Institute	Blacksburg, Va.
Asheville City Schools	Asheville, N. C.
Syracuse University	Syracuse, N. Y.
Tulane University	New Orleans, La.
Public Schools	Buffalo, N. Y.
Spokane Public Schools	Spokane, Wash.
Marietta High School	Newark, N. J.
New Central High School	Johnstown, Pa.
Foch School	Detroit, Mich.
North Carolina State College	Raleigh, N. C.
Ohio State University	Columbus, Ohio
Massachusetts Tech.	Cambridge, Mass.
Colorado Agricultural College	Fort Collins, Colo.
University of Minnesota	Minneapolis, Minn.
University of Illinois	Champaign, Ill.
Rosary College	River Forest, Ill.
Purdue University	Lafayette, Ind.
College of the Pacific	Stockton, Calif.
Hazleton High School	Hazleton, Pa.
Piedmont Junior High School	Charlotte, N. C.
Villa Juliene High School	Dayton, Ohio
Butler High School	Springfield, Ohio
Grovefoot School	Columbus, Ohio

INTERNATIONAL TIME RECORDING CO.

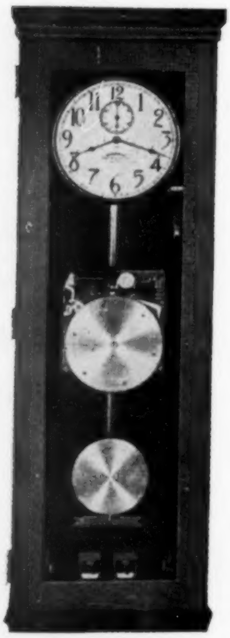
DIVISION OF

International Business Machines Corporation

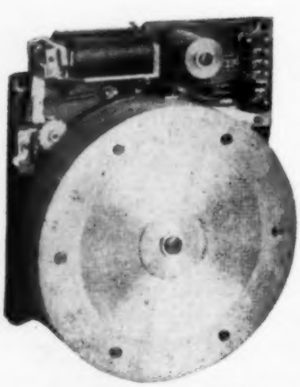
GENERAL OFFICES
270 Broadway
NEW YORK, N. Y.

CANADIAN DIVISION
International Business Mach. Co., Ltd.
300 Campbell Ave., Toronto, Ont.

Branch Offices and Service Stations in All Principal Cities of the World



COMBINED
MASTER CLOCK AND ALL
METAL PROGRAM CONTROL



UNIVERSAL ALL METAL
PROGRAM MACHINE

SELF-REGULATING ELECTRIC TIME SYSTEMS

The International Time Recording Company, pioneer manufacturer of time recording equipment, is today the largest, best equipped engineering and manufacturing organization in its field.

The International Electric Time System is equipped with an outstanding feature found in no other system —Automatic Self-Regulating Control —the latest and most important contribution to time system engineering. This exclusive feature provides accurate uniform time among all units of the system and eliminates the necessity of manual supervision or other maintenance.

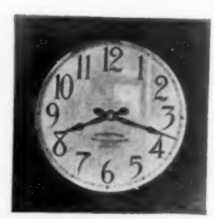
As applied to schools, this system consists of a Master Clock, any number of Wall Clocks and a Program Device operated directly from any light socket supplying A. C. or D. C. current.

The International Program Device is the most advanced type of schedule control—uses no paper tapes, is compact, extremely flexible and absolutely dependable. It provides a reliable means of handling the movement of classes and controlling study routines through the automatic operation of buzzers, bells or gongs, etc.

From a purely engineering standpoint, International Self-Regulating Electric Time Systems and Program Devices have the endorsement of leading school architects throughout the country.

MARBLE DIAL
AUDITORIUM CLOCK

ROUND METAL
CLASSROOM CLOCK



WOOD CASE
SECONDARY CLOCK

METAL CASE GONG

DOUBLE GONG FIRE ALARM

BREAK GLASS STATION

MASTER CODE FIRE ALARM STATION

TELEPHONE AND FIRE ALARM EQUIPMENT

International Inter-Communicating Telephone Systems and Fire Alarm Systems incorporate all the best features of construction and simplicity of operation that are essential to modern school and institutional equipment.

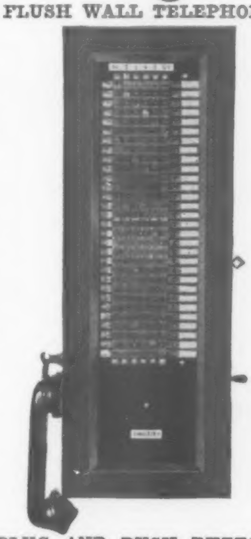
The International Telephone System is of the central station type, specially adapted for use in schools and similar institutions. The equipment is rugged in construction, simple in operation and furnishes the highest quality service at a minimum cost. This line offers a wide variety of styles to meet individual requirements.

International Fire Alarm Systems (Approved by Fire Underwriters) have been specially developed to provide the greatest possible fire protection for schools. All designs are simple, and the equipment is of such heavy, rugged construction that its dependability cannot be questioned.

This line, including the most modern regulation types of equipment, is furnished to operate from electric light socket or dry batteries as desired.

SURFACE WALL TELEPHONE

FLUSH WALL TELEPHONE



PLUG AND PUSH BUTTON BOARD WITH MASTER TELEPHONE

When building or remodeling, send for an International representative. He is well versed in school requirements and is prepared to give expert assistance in planning a complete Time, Telephone and Fire Alarm System.

The International Time Recording Company maintains a competent engineering service that is invaluable to school officials and architects.

Write for special literature or consult our nearest office.

Established 1897 Telephone: CAMden 487

JOHN E. LINGO & SON, INC.

Manufacturers and Erectors of

Flagpoles in Copper Bearing Steel and Bronze

29th & Buren Aves., Camden, N. J.

Two Distinct Types of Flagpoles

SWAGED SECTIONAL FLAGPOLES

fabricated of Copper Bearing tubular steel pipe in three weights for ground setting: Light Pattern, Heavy Pattern and Extra Heavy Pattern; and fabricated in two weights for roof setting: Heavy Type and Extra Heavy Type.

CONTINUOUS TAPERED FLAG-POLES

made in either steel or bronze with smooth uninterrupted exterior surface, tapered conically or with entasis; resemble in contour the appearance of wooden flagpoles and have no visible joints throughout.

Swaged Sectional Flagpoles

Our swaged sectional poles are fabricated by joining consecutive diminishing diameters of new mill run of full weight standard, open-hearth, lap-welded, Copper Bearing steel, tested pipe with the joints either of the **shop** type (swaged, telescoped and shrunk) or of the **field** type (swaged and self-aligning). All joints are constructed without the use of bolts, pins, rivets, screw couplings or lead calking. Poles of this type are designed to withstand wind stresses up to 90 miles per hour with a conservative bending resistance. These poles are shipped in one or more knocked down sections and assembled on the ground by means of the field joints. Each section is made to suit car lengths which allows transportation at a minimum rate for less than carload lots and each section may contain two or more pieces to produce the proper reduction. At the erection site the flagpole erector merely pushes or telescopes the sections together and after erection makes the field joints airtight and watertight by calking metal to metal with only an ordinary hammer and calking chisel. Inexperienced men may, in a minimum length of time, accomplish the erection of our swaged sectional flagpoles.

Continuous Tapered Flagpoles

Especially designed for memorials, monuments and buildings of exceptional architectural value. Continuous Tapered Flagpoles are of an entirely different construction from the swaged sectional poles and are more costly. These poles are produced in either steel or bronze and may be tapered conically or with entasis. They have a smooth uninterrupted exterior surface throughout without visible joints or offsets and resemble in contour the obsolete wood flagpoles. Continuous Tapered Poles are not carried in stock and are made to order only. The lower one-third of the visible height of these poles is cylindrical, the diameter of which corresponds to a standard pipe size and the tapered section is confined to the remaining visible height. When poles of this type are used as flagpole monuments or memorials the Architect of the

project usually designs a special bronze base and special stone work. We gladly offer our services to Architects by assisting them in properly designing the necessary foundation so that no damage may result from vibration, water or by the water freezing. Continuous Tapered Flagpoles, regardless of length, are usually shipped in one piece each, without field joints, but where shipping and handling will not permit the poles are shipped in two sections each and assembled at the erection site by means of a special field joint. This assembling, however, cannot be accomplished by inexperienced men and we will not ship Continuous Tapered poles in sections unless the assembling in the field is accomplished by our own men. This tends to enhance the cost slightly but insures the purchaser a first class installation which might be marred through the neglect and inexperience of others doing this work.

Further information regarding Continuous Tapered Flagpoles will be mailed to those interested upon application.

Installations

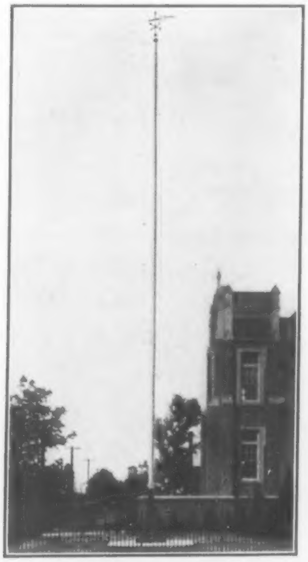
University of Kansas Stadium, Lawrence, Kansas
University of Michigan Museum, Ann Arbor, Michigan
University of North Carolina Stadium, Chapel Hill, N. C.
Mercersburg Academy, Mercersburg, Pa.
Font Bonne College, St. Louis, Mo.
Luther College Gymnasium, Decorah, Iowa
University of Rochester Hospital, Rochester, N. Y.
Concordia Teachers College, River Forest, Ill.
State Normal School, Salisbury, Md.
School of Mines, Rapid City, South Dakota
Philadelphia Public Schools (over 185 installations)

Catalog

Our new 60-page General Catalog, enlarged and revised, containing full information, prices and specifications of Swaged Sectional and Continuous Tapered Flagpoles, gladly mailed upon request.

90 X 99-FT. HEAVY PATTERN SWAGED SECTIONAL FLAGPOLE

One of the 185 manufactured and erected for the Philadelphia School Board.



60-FT. ABOVE GRADE CONTINUOUS TAPERED POLE

7⅝-in. butt x 3½-in. top. Parochial School, Riverside, N. J.

80-FT. OVER-ALL CONTINUOUS TAPERED POLE

14-in. butt x 5-in. top. Massachusetts Mutual Life Insurance Building, Springfield, Mass.

THE NORTH ELECTRIC MANUFACTURING CO.

AUTOMATIC TELEPHONE EQUIPMENT

Galion, Ohio

Established 1884

Products

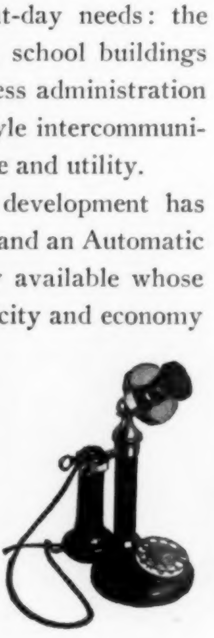
Private Automatic Telephone Systems

City Automanual Telephone Exchanges
City Dial-Automatic Telephone Systems
Remote-Controlled Telephone Exchanges
Remote-Control for Power Systems
Automatic Dials; Telephone Relays

Telephone Facilities in Schools

Present-day school construction and administration have created a need for rapid and reliable telephone service throughout the entire organization. In past years intercommunicating systems of the key-per-station type having a limited capacity have been used with no small degree of success. However, old-time methods are no longer adequate to meet present-day needs: the increased size of modern school buildings and their extensive business administration have outgrown the old-style intercommunicating systems both in size and utility.

Fortunately telephone development has kept abreast of the times, and an Automatic Telephone System is now available whose ease of installation, simplicity and economy of wiring, speed of operation, and uninterrupted service free from maintenance meet the many exacting requirements of present-day school telephone service exactly and economically.

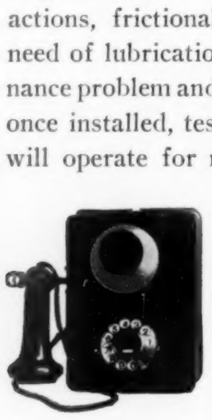


The "All-Relay" Automatic Telephone System is this latest development in the telephone art. It is the result of many years of practical experience and intense study in the development of an Automatic System free from the repeated interruptions of service and constant skilled attention in maintenance required by the earlier types of Automatic Telephone Systems.

As its name implies, the "All-Relay" System is composed of a combination of telephone relays—one of the simplest of electrical devices. These relays are the acme of simplicity, having but a single moving member supported on a knife-edge bearing, operated by direct application of force, with minimum latitude of motion, free from friction.

No Maintenance

The elimination, in the "All-Relay" System, of complicated mechanisms with their large latitudes of motion, their hammering actions, frictional operation and constant need of lubrication, has solved the maintenance problem and produced a system which, once installed, tested and placed in service will operate for months if not years at a time without routine maintenance attention. This claim, it is believed, cannot conscientiously be made for any other type of Automatic Telephone System.



Automatic Service

The "All-Relay" Automatic Telephone System provides instant communication at all times. Principal, Faculty, Engineer or Janitor are always within the range of the Automatic Telephones or the ubiquitous call system.

Its automatic operation, incomparably faster than manual operation, eliminates those irksome moments of waiting and gives the satisfied assurance of reaching your party regardless of his or her whereabouts in the building.

The cost of manual operators is saved, because the Automatic System dispenses with operators—it is self-operating. Instant service is thus ensured morning, noon and night; no inattention, no delays, no misunderstandings.

Telephones

Automatic Telephone instruments with dials are used as illustrated. These are the highest grade standard telephone instruments as used in City Exchanges for long distance transmission.

Wiring

The most economical and efficient wiring scheme, consisting of a single pair of wires between each telephone instrument and the central exchange equipment, minimizes installation costs and permits additions and changes to be made at little expense.

Operation

In operation the "All-Relay" System is simple, rapid and practically noiseless.

To make a call simply lift the receiver and dial the required number—the exchange does the rest.

Ringing is instantaneous, intermittent and automatic; there are no keys or buttons at the telephones.

Each line is able to communicate with every other line.

Conversations are secret and guarded from interference except as otherwise provided for.

Access to a busy line is automatically prevented and a distinctive tone transmitted to the station attempting.

Secrecy or Supervision

The fact that the "All-Relay" System functions automatically without an operator, ensures absolute secrecy of conversations. If supervision is desired to safeguard against improper use of the system a Monitor Feature is furnished. Executive-Right-of-Way service can be furnished for a limited number of stations, giving the user absolute priority of service and access to all lines whether idle or busy.

Emergency

In case of FIRE or other EMERGENCY the Automatic System continues to render instant service under conditions in which human life is impossible.

Capacities

The "All-Relay" System is made in a number of practical sizes to meet all conditions. **Write for full particulars and list of users.**

PEERLESS UNIT VENTILATION CO., INC.

Bridgeport, Connecticut

PEERVENT

UNIT SYSTEM

Of Heating and Ventilating

The PeerVent System of heating and ventilating consists of a series of units—usually one unit for each room to be served—which draw in fresh air from outdoors, heat it to any required temperature, and deliver it in such a way that perfect diffusion is obtained without drafts and without the slightest noise.

How It Operates

Fresh air is drawn in through an opening in the back of the unit, usually near the floor, by two multi-blade fans, which are operated by a small electric motor at comparatively slow speed. The outdoor air is driven upward by the fans through a special copper radiator. This radiator is so efficient that it will heat the incoming fresh air from a very low outdoor temperature to whatever degree is desirable for the particular room being served. The warmed fresh air passes out of the unit vertically through a grill at the top, at considerable velocity, and so directed that it is thoroughly diffused throughout the room. Seats placed close to a PeerVent are not uncomfortably warm, as they are when placed close to ordinary radiators. There are neither cold drafts nor blasts of too-warm air in any part of the room.

Temperature Control

Control of room temperature is secured by means of a mixing damper situated between the fans and the radiator. This damper can be adjusted forward and backward, under hand or automatic control, in such a way that the incoming cold air is either all passed through the radiator, or all by-passed around the radiator, or partly through and partly around it, the heated and unheated air being thoroughly mixed as the air leaves the unit. The mixing damper has nothing whatever to do with the volume of incoming fresh air. This volume is constant, as predetermined by the requirements of the room.

Recirculation

In order to heat an unoccupied room quickly after periods during which no steam has been supplied to the radiators, with the least possible expenditure of fuel and in the quickest possible time, it is possible to shut off entirely the flow of air from outdoors and to recirculate the air in the room. This is accomplished in the PeerVent by means of a single damper. The motor and fans need not be operated while the room is unoccupied, unless it is necessary to increase the temperature by means of recirculation.

Automatic Control

Automatic temperature control of the PeerVent Unit can be provided by means of a thermostat, which operates the mixing damper. Pneumatic control of the combination fresh-air and recirculation damper can also be provided, so that ventilation of each room in the building can be started and stopped from a central point in the basement or elsewhere.

The fresh-air damper also can be controlled automatically. A simple automatic device permits the machine to recirculate the air in the room when starting in the morning, until the room temperature reaches 65 degrees (or any other predetermined point within a range of 15 degrees). At this temperature the fresh-air intake damper will open automatically, thus stopping recirculation, and the machine will continue to deliver its rated volume of ventilation as long as the room temperature is normal. If the room temperature at any time should fall below 65 degrees, the fresh-air intake damper is closed automatically and remains closed until the temperature again reaches 65 degrees. This control is so designed that when the unit motor stops, the fresh-air intake damper is automatically closed, making it impossible for cold air to enter the room through the unit during periods of vacancy or at other times when the unit motor is not running.

TYPICAL CLASSROOM INSTALLATION

Advantages of the PeerVent System

Each PeerVent is entirely independent. The cost of running it depends upon actual service rendered in the one room which it serves, regardless of any other room in the building. The system has ample flexibility to meet changing weather conditions, changes in the direction and velocity of the wind, and other variable conditions.

STANDARD PEERVENT HEATING AND VENTILATING UNIT

All expense for ventilating unoccupied rooms is eliminated. If one or a few rooms are needed after school hours, they can be heated and ventilated without waste. An open window in a single room cannot disrupt the entire heating and ventilating system throughout the building, as in the case of a central system.

Quiet operation has always been a characteristic of the PeerVent System. The latest Units have improved fans which can be run slower than formerly for a given volume of air. This and other improvements make the modern PeerVent absolutely silent in operation.

There are no bulky or complicated mechanisms in connection with the PeerVent System. The unit itself is extremely simple in construction, and there are no parts that are likely to wear and cause trouble in the course of long service.

The unit system requires no apparatus room in the basement, and no built-in or sheet-metal heat flues, thus saving much space for more advantageous uses or saving excavation if the additional floor space in the basement is not needed. Much expensive ceiling construction is eliminated, permitting reduced story heights and enormous savings in the building construction costs. The unit system also eliminates heat duct losses.

The PeerVent System costs less to install and operate, as compared with a central fan system. It is easy to plan and lay out, and no special provision for ventilation need be made in the building design, excepting the small air inlet openings. When additional units are added to an existing building, PeerVents can be installed in the new rooms as required. The PeerVent System can also be installed in an old building, as readily as in a new one.

Various combinations of hand and automatic control are available. All dampers can be hand-operated, or all of them can be operated automatically, or combinations of hand and automatic control can be used.

Latest Improvements

All important unit features have been improved in the latest PeerVent machines, including the radiator, motor, fans, and controls. The radiator is especially well made, having unequaled thermal efficiency and the strength necessary to insure trouble-free service. The unit is remarkably compact—only 36 inches high and 14 inches deep, the width varying with the capacity of the unit.

All parts of the PeerVent are easily removable without tools.

Service Backed by Experience

The Peerless Unit Ventilation Company was the pioneer manufacturer of heating and ventilating units. Peerless Units installed nineteen years ago are still in service and giving perfect satisfaction.

PEERVENT UNIT WITH FRONT REMOVED, SHOWING FANS (1), AIR FILTER (2), AND PEER FIN RADIATOR (3)

A catalog will be sent on request. Detailed drawings of the units, and tables of engineering data, will be found in Sweet's Architectural Catalog. Any special information will gladly be furnished on request.

PITTSBURGH REFLECTOR CO.

304 Ross Street — Pittsburgh, Pa.

Manufacturers of "Permaflectors" the Silver-Plated Glass Reflectors for Practically Every School Lighting Need

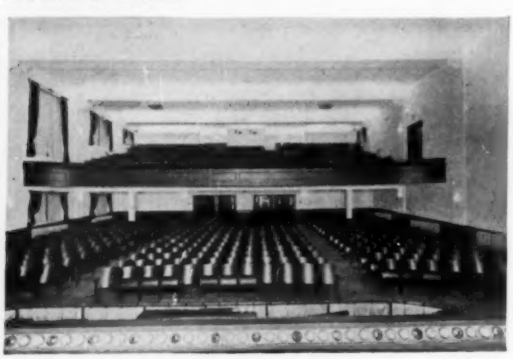
For twenty years, we have specialized in the artificial lighting field and have accumulated a fund of information that is valuable to anyone having problems of this nature. This information is at your service without obligation on all problems relating to lighting for schools and universities, such as auditoriums, gymnasiums, libraries, class rooms, floodlighting of athletic fields, etc.

Write for our catalog on Permaflectors. We also have available a booklet dealing with the specific lighting problems for schools and universities, which is free for the asking to those interested in the subject. (Folder PL-SC.)

LIBRARIES

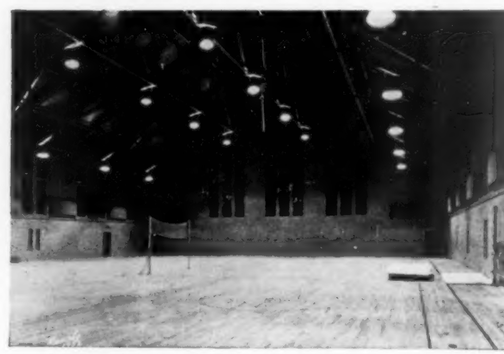
For the lighting of school libraries, there is probably no better method than by cove or other indirect lighting. Indirect lighting of high intensity, as shown above, reduces bothersome shadows to a minimum; relieves eye strain and makes for more pleasant, comfortable reading rooms.

AUDITORIUMS



Auditorium lighting in High School at Carmichaels, Pa. One of the best lighted schools in that section. Lighted in color by Permaflectors in coves. Note the even distribution of soft yet high intensity illumination.

GYMNASIUMS



The University of Washington has found Permaflectors ideally suited for many school lighting needs. Their Women's Gymnasium is lighted by Permaflectors mounted high above the playing floor, and protected from danger of breakage by a stray basketball, volley ball, etc.

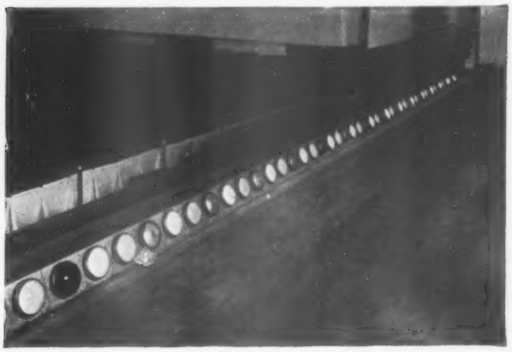
CLASS ROOMS

The class room or lecture hall is another place where ample illumination must be furnished without glare or shadows. The illustration shows how effectively this is accomplished by the use of Permaflectors in special wall urns and indirect fixtures at the University of Washington.

COVERED ATHLETIC FIELDS

The Athletic Pavilion at the University of Washington. Illuminated by 96 Permaflectors I-1000, mounted high above the floor and seats, eliminating glare in the eyes of players and audience. Visiting athletes have pronounced it the finest illumination possible for indoor athletics.

STAGE LIGHTING



Permaflector footlights are made to order to fit any size stage. Self-enclosed, dust-tight units. Front plates are removable in individual sections to get at the wiring, change lamps, etc.

GENERAL ILLUMINATION

Permaflectors find a wide application for general lighting purposes. The illustration shows a laboratory in the Physics Building, University of Washington. Permaflectors B-500 in special fixtures are used throughout this building, with the exception of a few apparatus rooms.

FLOODLIGHTING

In the last few years, floodlighting has taken its place in the scheme of things around many schools and colleges throughout the country. The playing of football games at night is becoming more and more popular each season. Johnstown, Pa., High School football teams find Permaflector Floodlights literally turn night into day for their after-dark games.

Westminster College, New Wilmington, Pa., uses Permaflector Floodlights to illuminate the tower of one of their main buildings, making it a beauty spot of the community.

SEDGWICK MACHINE WORKS

Manufacturers of

Hand Power Dumb Waiters and Elevators

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New York, N. Y.

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BALTIMORE, MD., Walter S. Brauns, 509 N. Charles St., Tel. Vernon 6003
WASHINGTON, D. C., Barber & Ross, 11th and "G" Sts., N.W., Tel. Main 8206
CLEVELAND, OHIO, Chas. E. Lewis, 1737 E. 18th St., Tel. Prospect 1795
DETROIT, MICH., The Rayl Co., 1233 Griswold St., Tel. Randolph 4300
CHICAGO, ILL., Standard Equipment Co., 400 W. Madison St., Tel. Franklin 7905
SEATTLE, WASH., S. W. R. Dally, 332 Pioneer Bldg., Tel. Main 8678
LOS ANGELES, CAL., C. P. Helpman, 722 Story Bldg., Tel. VanDike 0572

The above will go anywhere within reasonable distance to study your problems. Information promptly furnished to any other part of the country.

SEDGWICK
Dumb Waiters - Elevators
FOR SCHOOLS

"TYPE FDCG" SEDGWICK DUMB WAITER

Products

Hand Power Dumb Waiters and Elevators of all types and for every purpose; Book Lifts; Freight Elevators; Trunk Lifts; Sidewalk Elevators; Laundry Lifts; Ash Hoists. Special outfits designed to meet special conditions or requirements.

Consultation Service

An experienced staff of engineers is maintained to cooperate with you in the selection of suitable type of outfit to meet your requirements. Not even the most expensive equipment will give satisfaction unless it is specifically adapted to individual requirements and properly installed. Sedgwick Architectural and Engineering Service places at the disposal of schools, without charge, the benefit of specialized experience of nearly half a century. We ask you to make use of this service and if your problem can be solved by hand power or gravity our engineers will offer the solution.

Installation and Guarantee

Proper installation is essential to satisfactory operation. Blue prints and full directions for installing are furnished with each outfit, from which local labor can install. Or, we will send our own experienced mechanics on request. Customers will always secure better results by purchasing complete outfits rather than by securing part of the equipment from local sources. Sedgwick dumb waiter machines are guaranteed for 5 years against defects in workmanship and material.

Sedgwick Dumb Waiters in the School

Because of the economy of hand power operation and long proved dependability, Sedgwick Dumb Waiters have been installed in schools and colleges throughout the world and are giving efficient and reliable service day after day and year after year, lifting or lowering books, food, stationery supplies and countless other school loads.

When construction or conditions of the school building will not permit the location of kitchen and cafeteria on the same floor, without using space more valuable for other purposes, it is often advantageous to locate the kitchen on another floor and, by installation of suitable dumb waiter equipment, service between floors is economically and satisfactorily handled. Or, if it is desirable to utilize basement space for storage of supplies, distribution to all floors can easily and quickly be accomplished by dumb waiter transportation.

The Sedgwick Type "FDCG" Geared Automatic-Brake Dumb Waiter has been specially designed for service in schools, colleges, libraries, etc., where average loads do not exceed 50 pounds but where capacity or test loads up to 150 pounds may be carried.

The Sedgwick Automatic Brake assures safety in operation, the car being automatically held at any point in the shaft as soon as operator stops pulling the hand rope. Anti-friction steel roller-bearings increase ease of operation and machine-cut spur gears eliminate unevenness in performance.

Answers to the following questions will ordinarily enable us to make recommendations intelligently:

(1) What is the outfit to be used for?
(2) How large a car is desired?
(3) How far does the car travel?
(4) Have you a place prepared for the outfit?
(5) What will be the weight of average loads?
(6) What will be the weight of heaviest loads?
(7) Are loads all up, all down, or both up and down?
(8) Who will operate; men, women, boys or girls?
(9) Are all doors located in same front?

Sedgwick Book Lifts

School and University Libraries have found Sedgwick Dumb Waiters valuable labor-saving equipment when used as Book Lifts. The regular construction is used where enclosures are necessary. Brass and steel tube dumb waiters are selected where open construction is preferred. Consultation is advised in order to secure equipment which will be completely satisfactory. Sedgwick Book Lifts are built in all capacities and types suitable for every requirement. Specify load to be carried, normal and maximum, and size of car required.

SEDGWICK
Dumb Waiters - Elevators
FOR SCHOOLS

Sedgwick Elevators in the School

Some requirements of service in schools, colleges and similar institutions frequently call for equipment designed to carry loads greater than those for which Sedgwick Dumb Waiters are designed. For such needs we recommend Sedgwick Hand Power Freight Elevators. These elevators embody every known improvement for safe, easy and economical operation, having an iron-frame machine fitted with steel brace rods and steel shafting, spur gears, hoist wheels and band brake, all a self-contained unit. The spur gears are of ample size and strength and all shafts revolve in steel anti-friction roller bearings.

The Sedgwick Band Brake and "Automatic Locking Device" permit perfect control by means of a brake rope which is applied by the operator. A slight pressure retards and governs the speed and a final downward pressure automatically locks the brake. The band brake is adjustable for wear and practically indestructible. The car is carried by two standard hoisting cables, independently attached to car and counterweight, each of ample strength to sustain the car with capacity load if used alone, and each acting as a safety for the other.

Sedgwick Freight Elevators are almost invariably used with entire satisfaction during the life of the building in which they are installed.

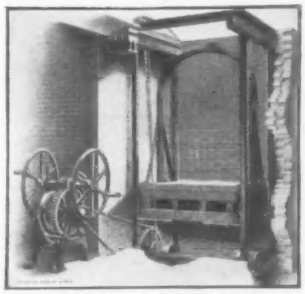

TRUNK LIFT

Trunk Lifts

Sedgwick Trunk Lifts are easy-running freight-type elevators with platform slatted on sides and back. They are usually made about four feet square to carry school furniture, trunks, supply carts and other bulky articles from one floor to another. However, they can be furnished in special sizes to meet special conditions.

Sedgwick Sidewalk Elevators

Supplies can be lowered from the sidewalk or waste material, ashes and other loads carried from the basement by the use of Sedgwick Hand Power Sidewalk Elevators.


SIDEWALK ELEVATOR

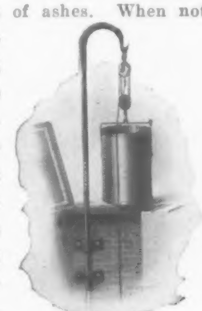
Low installation cost and practically no maintenance expense are features contributing to make this equipment a safe, satisfactory and economical solution of a difficult problem in school buildings.

Laundry Lifts

Sedgwick Freight Elevators as well as Sedgwick Dumb Waiters, according to the capacity required, make exceptionally serviceable Laundry Lifts.

Ash Hoists

The Sedgwick Ash Crane is a very simple and convenient device for hoisting cans of ashes. When not in use the Crane is dropped below sidewalk level. When raised to position shown in cut the Crane may be swung to any position required, thus permitting the cans to be raised without coming in contact with surrounding walls, and when the cans are above the sidewalk level the Crane may be swung around so as to deposit load upon the sidewalk.


ASH CRANE

TYPES AND USES OF SEDGWICK EQUIPMENT IN SCHOOLS AND UNIVERSITIES

Kind of Load	Average Weight	Capacity	Type	Convenient Size, Wdth. Dpth.	Space Required, Wdth. Dpth.
Books, stationery, food supplies, laundry	up to 75 lbs.	200 lbs.	"FDCG" Dumb Waiter	32" x 28"	37" x 31"
Food or book buses and supplies in bulk	up to 150 lbs.	350 lbs.	"Sedg-Versal" Dumb Waiter	28" x 36"	34½" x 39"
Basement - to - Sidewalk, supplies, equipment, ashes	up to 500 lbs.	1500 lbs.	Sidewalk Elevator	48" x 48"	62" x 50"
Furniture, trucks, laundry hampers, supplies.	up to 300 lbs.	1000 lbs.	Trunk Lift	48" x 48"	57¼" x 52"
Occasional ash cans	15 lbs.	25 lbs.	Ash Crane		36" x 36"

SPEAKMAN COMPANY

Wilmington, Del.

Makers of

SPEAKMAN SHOWERS

and

Plumbing Fixtures

When you think of showers—think of Speakman. Being the largest manufacturers of showers in the world (making over 100 different type showers), we are ideally equipped to co-operate with you in suggesting units that will prove most satisfactory and economical in the long run. The countless Speakman Showers in leading schools and colleges all over the country are striking proof of Speakman quality and durability.

An exclusive Speakman development is the Self-Cleaning Anystream Shower Head illustrated and described below. Its many unique features have a peculiar appeal to school executives who desire equipment that, literally, takes care of itself.

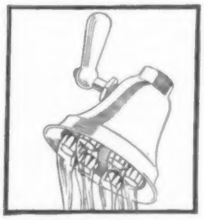
No matter what your shower problems, turn to us for their solution.

In selecting Speakman Showers and fixtures, you have a choice of finishes in either nickel or the non-tarnishing chromium plate of which use the Speakman Company were the pioneer developers in the plumbing fixture field.

K3395 — Speakman Chromium Plated Self-Cleaning Anystream Shower Head. The lever may be adjusted in a second to give the kind of shower the user wants, or to flush away sediment. Because of this easily adjustable spray, this shower head is ideally suited for school or college installation. No need to take the head apart for cleaning. The head merely screws on any shower and can be installed in a very few minutes.

K3397 — Speakman Chromium Plated Self-Cleaning Anystream Shower Head, same as K3395, except that degree of flow is operated by a screwdriver instead of lever. Intended for use where pressure is high, and regulation of flow is desired to conserve water. Head can be opened occasionally with screwdriver to flush out sediment. Where there is a battery of showers, the heads nearest the supply can be cut down so as to equalize the flow from each shower.

A TURN OF THE LEVER GIVES A NORMAL SPRAY



ANOTHER TURN SLUICES ALL THE SEDIMENT AWAY

OR YOU CAN ADJUST TO A VERITABLE STINGING NEEDLE SHOWER

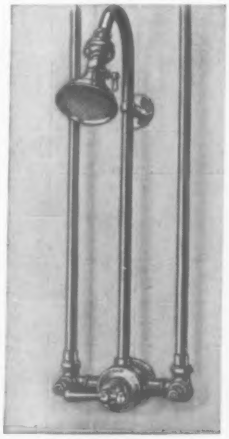
SPEAKMAN SHOWERS
and Plumbing Fixtures

K-2636M—**Speakman Built-in Heavy-wate Shower.** Size ½ inch. Hi-Seat Valves with unions, renewable seats, metal escutcheons and metal handles. Straight arm with metal escutcheon, elbow-ball joint with screw-driver stop and Self-Cleaning Anystream Head.

K2636 M

The object of the screw-driver stop shown in this illustration is to cut down pressure where it is high and also to control the amount of water used in installations where it is desirable to conserve water.

K2675—**Speakman Institution Mixometer Shower.** ½ inch size with lock-shield controlling valves on supplies to overhead, goose-neck discharge pipe with cast-brass supporting strap, and ball joint and 4-inch Anyforce cast-brass head. For use in a stall or in an open battery of showers. Also furnished with Self-Cleaning Anystream head.



K2675

Self-Closing Basin Faucet

K6790—The ideal faucet to eliminate water waste. Made of the highest grade brass, with heavy castings, these faucets are built to withstand hard usage. Furnished in nickel or Speakman Chromium Plate. The latter requires no polishing, keeps its bright lustre indefinitely.

Free

Write to us for literature describing in detail the many advantages of our Anystream Shower Head as well as a list of Speakman school and college shower installations. These will be sent you free upon request.

THE STANDARD ELECTRIC TIME COMPANY

Springfield, Mass.

The Standard Electric Time Co. of Canada, Ltd., 726 St. Felix St., Montreal, P. Q.

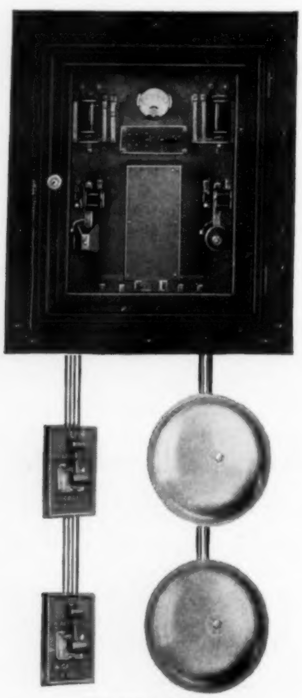
ATLANTA, 204 Glenn Bldg.
BALTIMORE, 2 E. Redwood St.
BIRMINGHAM, 2920—7th Ave., So.
BOSTON, 10 High St.
BUFFALO, Stock Exchange Bldg.
CHARLOTTE, N. C., 217 Latta Arcade
CHICAGO, 1510 Monadnock Bldg.
CLEVELAND, 1333 Union Trust Bldg.
COLUMBUS, O., 83 South High St.
DALLAS, 716 Mercantile Bank Bldg.
DENVER, 562 Pennsylvania St.
DETROIT, 806 Donovan Bldg.
KANSAS CITY, MO., Mutual Bldg.
LOS ANGELES, Room 670, 124 W. 4th St.
MINNEAPOLIS, 745 McKnight Bldg.
NEW YORK CITY, 50 Church St.
PHILADELPHIA, 1612 Market St.
PITTSBURGH, Bessemer Bldg.
PORTLAND, ORE., 65 First St.
SAN FRANCISCO, 1 Drumm St.
SCRANTON, 148 Adams Ave.
SEATTLE, 918 Western Ave.
SPOKANE, 110 S. Cedar St.
TAMPA, 114 W. Alfred St.

"STANDARD" Fire Alarm Systems

(Approved by Underwriters)

1. **Maximum Protection to Life and Property**
2. **Thorough Reliability**
3. **Simplicity**
4. **Economy in Operation and Maintenance Cost**

These are the qualifications which have made "Standard" fire alarm systems so successful everywhere and the choice of prominent architects, engineers and school officials.



(TYPE FBS)
CLOSED CIRCUIT SYSTEM

Closed Circuit Supervised Fire Alarm System

These systems are furnished to operate either from battery or A.C. power supply. Double supervision is provided with disarrangement warning bell and general code signal on single stroke gongs when a break glass station is operated.

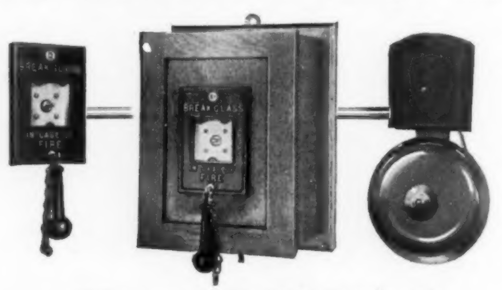
This system is as near fool proof as a fire alarm system can possibly be made,—the last word in school fire alarm equipment.

Station Coded System

These systems provide double code stations ringing distinctive signals from each box indicating location of fire and permitting safe exit.

Open Circuit System

In cases where our open circuit system is desired without the electrical supervision,



(TYPE 450) OPEN CIRCUIT SYSTEM

Type 450 is recommended. This operates similar to the closed circuit FBS system except for its open circuit and non-supervision features. Vibrating gongs are recommended as preferable with this type.

Write for Bulletins

See page 472 for laboratory equipment.

ELECTRIC TIME AND PROGRAM EQUIPMENT

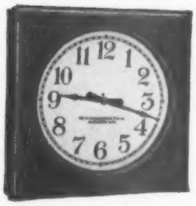


FIG. 116
SQUARE WOOD CASE SECONDARY CLOCK

Standard Electric Time products are the result of nearly half a century's experience in the manufacture and installation of school equipment. They are manufactured of the best materials obtainable, by skilled labor, under expert supervision, and are engineered and installed under a system which insures absolute satisfaction to the owner.

The "Standard" line of electric time equipment now comprises two distinct systems both of the minute impulse type. One is operated from battery—preferably storage battery type—the other the A.C. Constant Service type which operates from the A.C. lighting service with reserve power unit which functions instantaneously and automatically in case of current failure.

The "Standard" program clock is completely automatic, ringing the bells on predetermined schedule with automatic silencing feature. Bells and yard gongs are furnished in various styles and sizes.

FIG. 803
PROGRAM BELL

Standard secondary clocks are furnished in wide variety of designs with wood or metal cases also special marble or metal dials according to requirements.

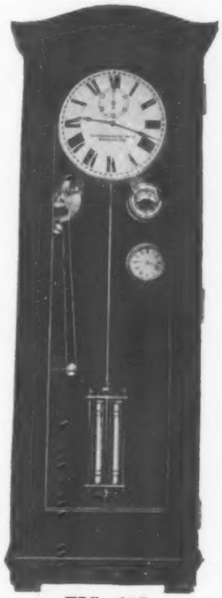


FIG. 105
MASTER CLOCK
60-BEAT MERCURIAL PENDULUM

FIG. 118
ROUND METAL CASE SECONDARY CLOCK

Standard Electric Time Equipment has been the predominant choice of school boards and architects for many years, owing to its superior excellence and unquestioned reliability. "Standard" manufactures and furnishes all types of program bells.

School Telephone System

The "Standard" School Telephone system is combined with the bell control board and furnishes a selective ringing, common talking system of the utmost simplicity and reliability operating from the same current supply.

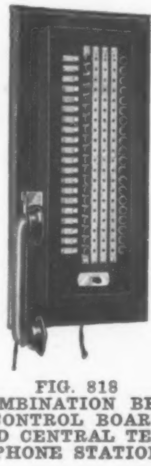


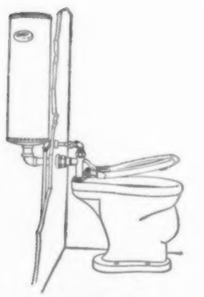
FIG. 818
COMBINATION BELL CONTROL BOARD AND CENTRAL TELEPHONE STATION

See page 472 for description of "Standard" laboratory systems.

Complete specifications, estimates and other data will be gladly furnished architects or other school officials upon request. Write Home Office or nearest branch.

FIG. 819
WALL TELEPHONE WITH WATCH-CASE RECEIVER

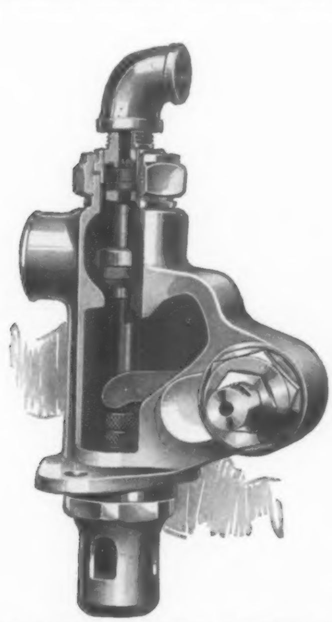
The valve in the Vogel Selflush Number Ten is extremely simple in construction. It has very few moving parts, and these are made of high-tension bronze, noted for its resistance to wear.



SHOWING HOW TANK IS PLACED BEHIND THE WALL WITH NUMBER TEN-A

Behind the Vogel Selflush Number Tens are more than 20 years' experience in the manufacture of seat-action closets.

The Vogel Selflush Number Ten-A, with tank concealed, has the same valve and construction throughout as the Number Ten. This closet can be supplied with a syphon jet bowl when desired, but we recommend the syphon action, and supply this type regularly unless syphon jet is specified by school boards and architects.



THE VALVE OF THE VOGEL NUMBER TEN AND NUMBER TEN-A CLOSETS. ON A TEST THIS VALVE WAS OPENED AND CLOSED AUTOMATICALLY 150,000 TIMES, AND DIDN'T SHOW A SIGN OF WEAR

OPEN FRONT SEAT—AIR-SEASONED HARDWOOD. INDESTRUCTIBLE HARD RUBBER COMPOSITION SEAT CAN BE SUPPLIED WHEN DESIRED

In the Vogel Number Ten and Number Ten-A closets there is no complicated piping. The valve and bowl are bolted together in such a way as to make a leak practically impossible.

The Bowl is heavy, two fired vitreous china, finished in a high, hard glaze. The Bowl retains its glass-like surface indefinitely, does not peel, and is easily cleaned with a damp cloth.

The Seat is of air-seasoned hardwood reinforced with steel dowels and finished in three coats of granite varnish. Either closed or open front seats can be supplied, and when desired an indestructible hard rubber composition seat can be furnished.

The Tank is heavy galvanized iron, but at a small additional cost can be supplied with lacquer enamel finish in any color desired. Each tank is carefully tested before leaving our factory.

Once installed Vogel Number Ten and Ten-A closets require no further attention. The only repair ever necessary is a washer which may have to be renewed after years of use.

Folders, Catalogs and other Literature on Request

WESTINGHOUSE ELECTRIC AND MFG. CO.

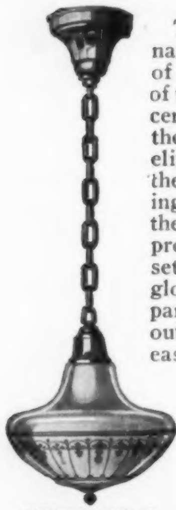
EAST PITTSBURGH, PENNA.

Offices in all principal cities throughout the United States

COMMERCIAL LIGHTING EQUIPMENT

The Westinghouse Electric & Manufacturing Company manufactures lighting equipment suitable for providing the proper distribution of light, free of glare and objectionable shadows, in any installation that is required in the educational institutions. In class rooms, laboratories, shops, offices, libraries and dormitory rooms, correct lighting should be provided.

FOR CLASS ROOMS, LIBRARIES, OFFICES AND DORMITORIES



SUSPENSION TYPE SOLLUX LUMINAIRE WITH PANELED HANGER AND DECORATED GLOBE

The Westinghouse Sollux Luminaire provides the highest quality of illumination. The globe contour of the Sollux utilizes the highest percentage of the light generated and the diffusing quality of the glass eliminates all glare. In the Sollux, the keeper ring method of supporting the globe in the hanger makes the globe totally enclosed and dustproof. It also eliminates unsightly set-screws and does away with globe breakage, due to unequal expansion and contraction. The tilt-out cap, another feature, permits easy replacement of the lamp without removing the globe from its holder.

Sollux is available with ornamental, paneled and plain hangers in both ceiling, suspension and semi-rigid types. Globes are plain and decorated, in sizes from 10 to 18 inches to accommodate lamps for 75 to 500 watts.

The Westinghouse Sollaire has practically the same efficiency of light distribution as the Sollux which it resembles greatly in appearance.

Certain Sollux features have been eliminated in the Sollaire and a considerable reduction in cost has thus been made possible.

CEILING TYPE SOLLAIRE WITH PLAIN GLOBE

The Sollaire comes with plain and paneled hangers for the ceiling type and with chain and semi-rigid hangers for the suspension type. Plain and decorated globes are available in sizes from 8 to 20 inches in diameter for lamps of from 50 to 1000 watts.

The Westinghouse Sollite offers a more angular globe for those to whom the Sollux and Sollaire globes do not appeal or who wish to use a globe with decoration in the more modern style. The Sollite comes in the plain, banded and **art moderne** styles. The diffusing glass used in the globe is of the same efficiency and quality as that used in Sollux and Sollaire Luminaires.

The simplified mechanical construction of the Sollite allows it to be offered at a lower price and the improved globe holder furnishes a quicker means of attaching and removing the globe.

CEILING TYPE SOLLITE

The Sollite is available in ceiling and suspension types with globes from 8 to 20 inches in diameter for lamps of from 50 to 1000 watts capacity.

Listed in the Westinghouse Commercial Lighting Catalog 219-B.

FOR LABORATORIES AND SHOPS

For laboratories and for any other installations, where there may be corrosive fumes, the Chromilux should be used. It is similar in construction to the semi-rigid Sollux, with the exception that the hanger is chromium plated. Chromium plating takes a permanent bright finish and is not subject to corrosion. Listed in Commercial Lighting Catalog 219-B.

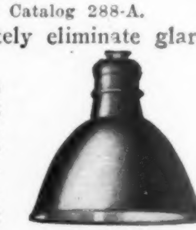
For foundry, laboratories and similar installations in engineering schools, Westinghouse improved vapor-proof units are suitable. They consist of cast-iron hoods, housing front-connected sockets, vapor-proof glass globes and suitable reflectors. They are easy to install and assure an installation that is positively unaffected by vapor and corrosive fumes.

GLASSTEEL DIFFUSER

For general lighting in manual-training shops, gymnasiums, pools, and similar installations, the Westinghouse line of Glassteel Diffusers and industrial reflectors assure a most satisfactory lighting installation.

Listed in Industrial Lighting Catalog 288-A.

Glassteel diffusers absolutely eliminate glare under all conditions.



STANDARD BOWL REFLECTOR

Standard bowl reflectors provide an intensified light upon the part of the working plane beneath it and for that reason are an ideal fixture for places where the requirements are such that strong local lighting must be provided.

AN ATHLETIC FIELD LIGHTED BY CHROMILITE PROJECTORS

FOR OUTDOOR LIGHTING

Westinghouse Chromilite Floodlighting Equipment is most suitable for lighting large outdoor areas, stadiums, athletic fields, and for the floodlighting of buildings and monuments. These Westinghouse projectors are of cast aluminum, equipped with a chromium-plated reflector. Chromium makes a most satisfactory reflecting surface on account of the high polish it takes and because it retains this polish permanently, and is easily cleaned. The different type designations are: CA-10, CA-14, and CA-16 which will take care of 150 to 200; 300 to 500; and 750 to 1000-watt lamps respectively.

Aqualux underwater projectors, in addition to transforming the ordinary swimming pool into an object of outstanding beauty, permit its more general use at night with even greater facility than in daytime.

Listed in Floodlighting Catalog 218-F.

THE ILLUMINATING ENGINEERING BUREAU

Westinghouse maintains this Bureau to give advice and help in planning correct lighting, yours for the asking. Requests can be made at any Westinghouse Agent-Jobber or District Office.

For Commercial Cooking, see pages 414, 415.

PANELBOARDS

NOFUZ PANELBOARD

Westinghouse manufactures a complete line of panelboards to meet all lighting control applications.

The Type NAB Nofuz is equipped with circuit breakers in the branch circuits in place of the conventional toggle switch and fuse. This new panelboard has many superior features such as: No fuses to change. Anyone can reclose the breaker and restore service as easily as a wall switch can be thrown. The circuit-breaker is tamper-proof as nothing can block its action or alter its operating characteristics. Circuit breakers can be obtained in 15, 20, 25 and 30-ampere capacities and are interchangeable.

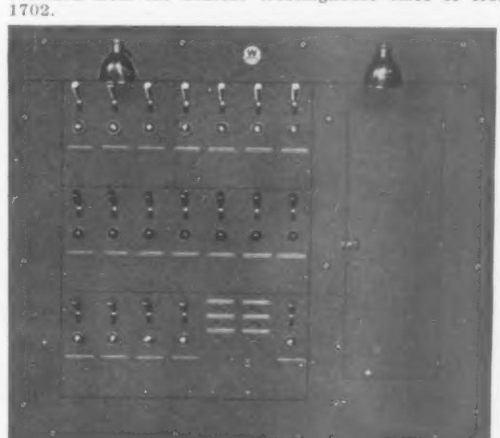
ST and NST panelboards, equipped with fuses and switches in the branches, and 2P and N2P panelboards with fuse protection only are also available.

Complete information on the entire line of Westinghouse panelboards is given in Panelboard Catalog 224.

Theater Switchboards

Westinghouse builds seven types of theater switchboards to meet the varied needs for control of colored lighting effects. Light, properly controlled, can add much to the effectiveness of the play or act. The audience, under the influence of colored light, unconsciously absorbs the spirit behind the production.

Complete information on theater switchboards can be obtained from the nearest Westinghouse office or from 1702.



THEATER SWITCHBOARD

ALBERENE STONE COMPANY

Quarriers and Fabricators of Alberene Stone

Main Office: 153 West 23rd Street, New York

Quarries and Mills at Schuyler, Va.

BRANCHES

Boston, Newark, N. J., Philadelphia, Richmond, Va., Rochester, Pittsburgh, Cleveland, Chicago, Washington, D. C.

Products (See also page 456)

Alberene Stone, a natural quarried stone, fabricated for the following purposes in school construction:

Stair Treads and Landings	Toilet Partitions
Door and Window Sills	Urinals
Plinths, Trim, Wainscot	Shower Compartments
Spandrels	Shower Dressing Rooms
	Flooring and Base

Physical Characteristics

Alberene is a natural quarried stone, blue-gray in color, non-stratified and free from cleavage lines, dense, uniform in texture and color, practically non-absorbent and non-staining, easily cleaned, flame resistant and fireproof. It is easily machined—tongued, grooved, slotted, bored or turned—without splitting or spalling.

Sanitary Work

The outstanding superiorities of Alberene for toilets, urinals and showers are: (a), its non-absorbent, non-staining, easily cleanable qualities; (b), its easy fabrication by means of tongue-and-groove, bolted-and-cemented joints, in structures that are impervious and 100% sanitary; (c), its non-spalling, non-chipping surface.

Stair Treads and Landings

A special grade of hard Alberene selected for these purposes has a "toothed" surface which never wears away and which is always non-slipping under all conditions. Its wearing qualities also are excellent, and it is absolutely fireproof.

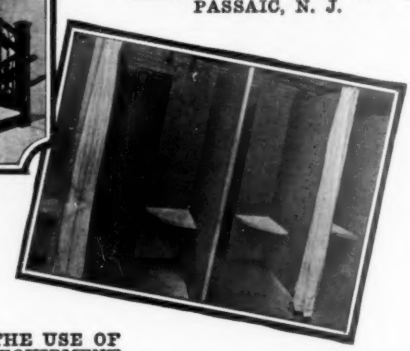
The Matter of "Life"

The limit of useful "life" of Alberene Stone has not yet been revealed in an experience of over 40 years. Barring accident, the moderate first cost of Alberene Stone equipment is the one and only cost—there are no after-costs.

TOILETS AND URINALS HIGH SCHOOL, MONTCLAIR, N. J.

STAIR TREADS AND LANDINGS HIGH SCHOOL, SOMERVILLE, N. J.

SHOWERS AND DRESSING ROOMS MEMORIAL SCHOOL NO. 11, PASSAIC, N. J.



THREE TYPICAL EXAMPLES OF THE USE OF ALBERENE STONE IN SCHOOL EQUIPMENT

AMERICAN ABRASIVE METALS CO.

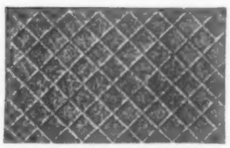
FERALUN—BRONZALUN—ALUMALUN—NICALUN

Names Reg. U. S. Pat. Off.

50 Church Street, New York City

BRANCH OFFICES

BUFFALO, Erie County Bank Building
BOSTON, 136 Federal Street
PHILADELPHIA, 1700 Walnut Street
PITTSBURGH, Farmers Bank Building
CHICAGO, 111 W. Washington Street
SAN FRANCISCO, 444 Market Street



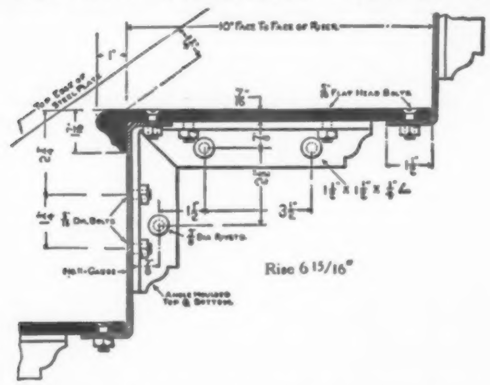
HATCH SURFACE

FERALUN
Anti-Slip Treads

Spell SAFETY in Your School

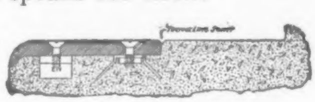
PLAIN SURFACE

FOR NEW BUILDINGS—STYLE "S"



THE STYLE "S" STRUCTURAL TREAD

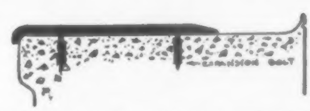
is especially designed for school installation, and is being specified by architects and school boards more and more each year. In 1928 FERALUN was installed in [illegible] schools in 39 states, bringing the total number of installations up to more than 1,900 in the last five years.—Such nationwide acceptance speaks for itself.



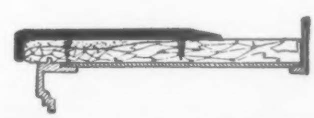
Style "A"
WITH METAL ANCHORS FOR NEW CONCRETE STEPS

SAFE STAIRWAYS PREVENT ACCIDENTS

FOR REPAIR WORK—STYLE "A"



TREAD FOR OLD CONCRETE STEPS



LONG LIP TREAD FOR WORN MARBLE STEPS

FOR REPAIRING AND MAKING SAFE, WORN STEPS OF ANY MATERIAL

FERALUN TREADS

are especially adapted for the repair of worn steps of any material and at small cost. FERALUN Treads are never slippery even when wet or covered with soapy or oily liquids.

WRITE FOR DETAILS

AMERICAN BLUE STONE COMPANY

Producers of

AMBLUCO

Reg. U. S. Pat. Off.

NON-SLIP BLUE STONE

STAIR TREADS, LANDINGS, SADDLES AND FLOORING

SALES AND CONSULTING OFFICES
101 Park Ave., New York

QUARRIES AND MILLS
Ambluco, Wyoming Co., N. Y.

Reg. U. S. Pat. Off.

Products

The AMBLUCO Non-Slip Products are milled from a natural quarried gray blue sand stone and are:

AMBLUCO Non-Slip Stair Treads
AMBLUCO Non-Slip Stair Landings
AMBLUCO Non-Slip Door Saddles
AMBLUCO Non-Slip Floor Joiner Strips
AMBLUCO Non-Slip Swimming Pool Coping
AMBLUCO Stair Tread Risers
AMBLUCO Wall Base and Plinths

AMBLUCO Non-Slip Stair Treads

These treads have established themselves wholly on their own merits, with practically no introduction on our part. Down through the ages, they have held alone the title of the Proved Super Stair Tread.

Durable, Non-Slip, Maintenance-Free, Sanitary, Quiet, Fire-Resisting, Substantially-Attractive and Economical—the essential tread qualities—are each found in the AMBLUCO Treads to a superlative degree.

AMBLUCO NON-SLIP TREADS
Columbia High School
South Orange, N. J.
Guilbert & Betelle, Architects

Durable

They outlast the life of a school and are at least 300% more durable than other natural stone and artificial treads.

Non-Slip

The 70% fine hard silica evenly distributed through the stone by nature produces a permanently uniform non-slip surface not possessed by any other tread.

Maintenance-Free

The first cost is the last cost. Never any need for resurfacing, resetting, tightening or replacing.

Sanitary

No grooves or pores to collect filth and disease germs and do not produce dust, features necessary to the health of pupils.

Quiet

AMBLUCO Treads do not resound from footsteps nor become loose and rattle.

Fire-Resisting

Their heat-resisting quality makes them of great value in fire emergencies.

Substantially-Attractive

These treads of two-inch standardized thickness are furnished at the same cost as thinner ones and give a most substantial installation.

Economical

With the lowest ultimate cost and a low initial cost the economy of the AMBLUCO Treads have the outstanding record of nearly half a century of service and yet never a replacement necessary.

The more thoroughly one investigates, the more pre-eminently AMBLUCO stands out as the peer of all stair treads.

Whatever you have heard about stair treads, and wherever you have heard it, you have never heard anything but praise for AMBLUCO.

AMBLUCO Non-Slip Interior Door Saddles have all the same qualifications and are correspondingly of equal value as the AMBLUCO Treads.

Our Catalogue 22H123, upon request, will be mailed to architects and engineers who desire to incorporate in their specifications and have in their buildings the best stair tread on the market.

THE BARRETT COMPANY

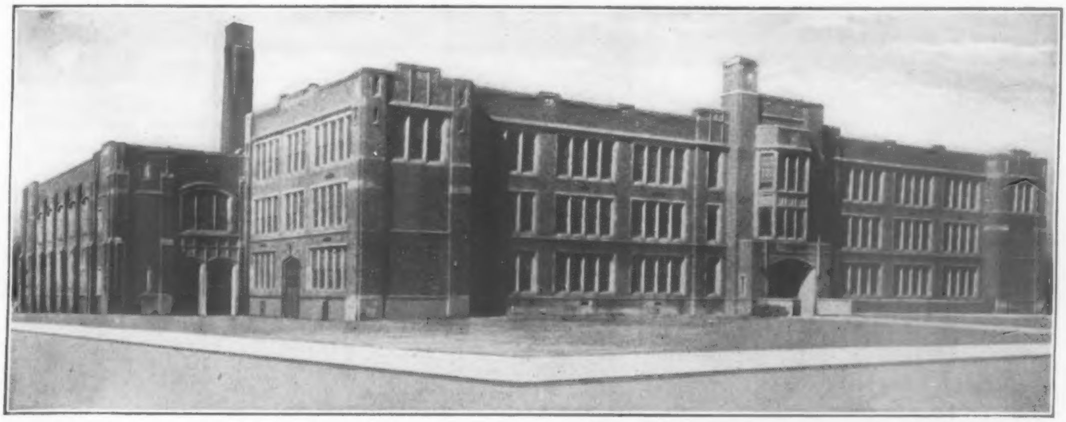
Manufacturers of Roofing Materials

NEW YORK, N. Y.

Birmingham, Ala.
Boston, Mass.

Chicago, Ill.
THE BARRETT COMPANY, LIMITED, MONTREAL, P. Q.

Philadelphia, Pa.
Minneapolis, Minn.



Royal Oak, Michigan, has roofed 16 schools with Barrett Specification Roofs in 7½ years. Above is shown Royal Oak Senior High School. Barrett Specification Roof applied by Charles Sexauer Roofing Company, Detroit. F. D. Madison, Royal Oak, Architect.

Products

Roofing materials—For flat surfaces: Barrett Specification Pitch and Barrett Specification Felt; Black Diamond Pitch and Black Diamond Felt.

For steep surfaces—Barrett Specification Felt, Barrett Specification Pitch, Anchor Asphalt and S. I. S. Roofing.

Miscellaneous—Waterproofing: For foundations, swimming pools, tunnels, floors, etc., special specifications submitted. Insulating and Building Papers. For sheathing, lining, etc. Damp-proofing and Preservative Paints, Wood Preservatives. Tarvia-lithic for playground surfacing, roadways, paths and tennis courts.

For complete information about these and other products, write The Barrett Company, 40 Rector Street, New York City.

America's Best-Known Roof—the Barrett Specification

The thousands of America's finest schools protected by Barrett Specification Roofs constitute an impressive demonstration of **value.** School boards appreciate that Barrett Specification construction combines fire-safety for the school children and long-run economy for the tax-payers.

Barrett Specification Roofs will outlast an ordinary roof—will long outlive the 20-year period for which they are bonded against repair and maintenance expense by a national bonding company. (The Barrett Company also has a Specification Type "A" Roof which is bonded for 15 years. The same high-grade materials are used, the only difference being in the quantities.)

Barrett Specification Roofs carry Class A—base rating—by the National Board of Fire Underwriters. Their slag or gravel surface is immune to flying sparks. **No roof-covering retards fire to a greater degree than a Barrett Specification Roof.**

Barrett Approved Roofers, each one selected for his experience, ability and integrity, apply Barrett Specification Roofs and offer the complete Barrett Roofing Service. There's a Barrett Approved Roofer located in your city. Consult with him or with us on any roofing problem.

Barrett Free Roof Inspection Service

On request one of our inspectors will make a careful survey of your roof, flashings, walls, coping, etc. This service is available for buildings with roof areas of 5,000 square feet or more that are located east of the Rockies. Address Barrett Roof Examination Service, The Barrett Company, 40 Rector Street, New York, N. Y. In Canada, write to The Barrett Company, Ltd., 5551 St. Hubert St., Montreal, P. Q.

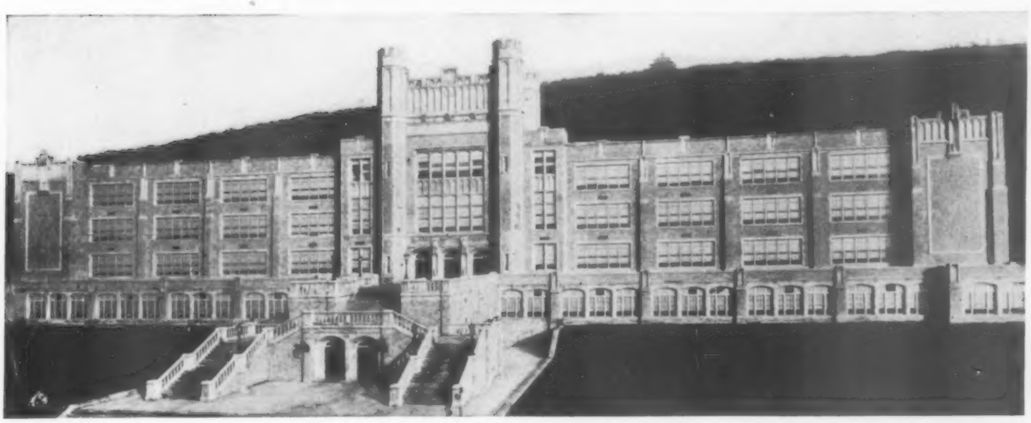
Barrett Specification Roofs
TRADE-MARK

THE DETROIT STEEL PRODUCTS COMPANY

2250 East Grand Boulevard, Detroit, Michigan

FACTORIES: Detroit, Michigan, and Oakland, California

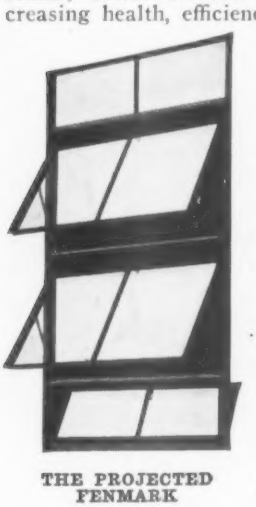
Fenestra
STEEL WINDOWS



Cosmopolitan High School, Reading, Pa. Ritcher & Eiler, Architects

Solid Steel Windows for All School Buildings

For class rooms, auditoriums, administration buildings, Fenestra "Fenmark" Windows have numerous advantages: Frames and sash of heavier, solid steel sections that do not warp, swell, shrink, stick or rattle. Fire resisting. Afford increased light, thus minimizing eye-strain; better control of ventilation thus increasing health, efficiency. Upper swing leaves open out casement fashion, easily washed from inside the building. Lower leaf tilts in, acting as a wind guard at sill. Ornamental solid bronze hardware.



THE PROJECTED FENMARK

Screens easily attached where required. Wide variety of standard types and sizes sufficient for all ordinary building needs. Any amount of clear opening provided up to 100 per cent. Complies with all building code requirements and accepted ratio of window area to floor area as established for schools.

For gymnasiums, laboratories, locker rooms, swimming pools, power houses, and other subsidiary buildings, Fenestra horizontally pivoted or projected windows are desirable. Ventilators either manually or mechanically operated, singly, in banks or in tiers. Easily cleaned from within. Self-locking cam handles. Can be arranged to open entirely outside the building to accommodate shades. Ventilation easily controlled from centrally located operating points. Fire hazards minimized. Insurance premiums reduced. Small glass lights permit easy and economical replacement when broken.

Fenestra Engineers gladly discuss Daylighting and Aeration problems, assist with window layouts, provide estimates on alternate types.

Fenestra erection force erect and install all windows where desired, insure satisfactory installation and efficient operation. A complete service.

THE CASEMENT FENMARK

THE HOLTZER-CABOT ELECTRIC CO.

125 Armory Street, Boston, Mass.

SALES OFFICES

ATLANTA, GA., H. Douglas Stier, 101 Marietta St.
BALTIMORE, MD., 1410 Standard Oil Bldg.
CHICAGO, ILL., 6161 So. State St.
CINCINNATI, OHIO, 1133 Chamber of Commerce Bldg.
CLEVELAND, OHIO, 516 Union Bldg.
DENVER, COLO., 7th and Lawrence Sts.
DETROIT, MICH., 509 Lincoln Bldg.
KANSAS CITY, MO., 301 Security Bldg.
LOS ANGELES, CALIF., 1553 No. Commonwealth Ave.
MINNEAPOLIS, MINN., 442 Builders Exchange Bldg.
NEW YORK, N. Y., 101 Park Ave.
OMAHA, NEBR., 923 W. O. W. Bldg.
PHILADELPHIA, PA., 900 Otis Bldg.
PITTSBURGH, PA., 606 American Bank Bldg.
ST. LOUIS, MO., 1529 Arcade Bldg.
SAN FRANCISCO, CALIF., 939 Larkin St.
SEATTLE, WASH., N. K. Staggs, 4227 35th Ave., South
SYRACUSE, N. Y., 403 Lafayette Bldg.
MONTREAL, CANADA, Century Electric Co., 491 St. Paul St., West

SCHOOL FIRE ALARM SYSTEMS

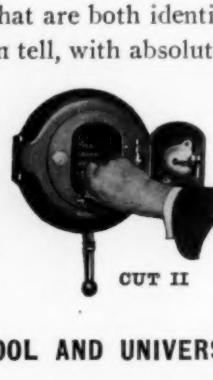
The functions of a fire alarm system in a school, should be: First, to so train the children by means of periodical fire drills that they will vacate the building quickly and without confusion; and Second, to call automatically the city fire department in case of actual fire. Any system which performs less than this is not giving to school children the fullest measure of protection from fire panic which should be theirs. Experience has shown that the best and most orderly response to fire alarm signals is secured in those communities where fire signals are uniform in all schools and are not used for any other purpose.

To best meet the above requirements, The Holtzer-Cabot Electric Co. unqualifiedly recommends its standard:

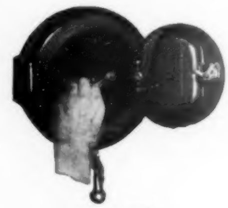
S. A. Fire Alarm System

This system is complete in that it provides for sounding a fire drill signal or a signal for actual fire that are both identical as far as the pupils can tell, with absolutely no chance of summoning the city fire department except for an actual fire. The operation of sounding a fire signal is shown in Cuts I and II.

CUT I



CUT II



CUT III

The sounding of an alarm for fire drill only is as shown in Cut III in which the front of the box is opened with a key. The opening of this door operates contacts which prevent the city fire alarm box from operating when the lever is pulled

The gong used with this system is of the electro-mechanical type, entirely distinctive from any other type of bell so that a fire signal can never be confused with other school signals

The entire system including all boxes and gongs and every foot of wire is supervised elecrically so that any disarrangement of apparatus or break in any of the wiring is instantly indicated by a warning or trouble bell. All wiring, current feeders, etc., are centralized at a control panel provided with volt and ampere meter, relays, pilot lamps, etc., so arranged and connected as to facilitate the ready location of broken wires or other troubles that might impair the operation of the system.

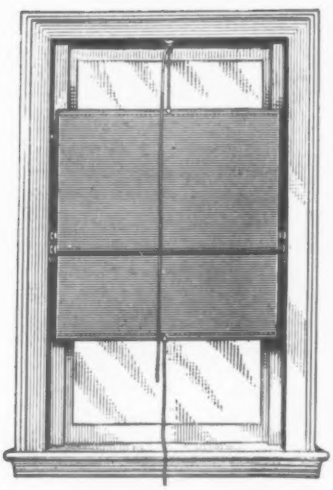
Complete detailed information covering these and other fire alarm systems are available by writing for bulletin on School Fire Alarm Systems.

INTERSTATE SHADE CLOTH CO.

Hoboken, New Jersey

THE LAPSLEY-INTERSTATE SHADE CLOTH CO.,
Baltimore, Maryland

INTER-TWILL
WINDOW
SHADES
WILL OUTWEAR THEM ALL
THE STRENGTH IS IN THE TWILL



Double Hung Window Shade Installation

Two window shades are installed at center of window. One shade may be pulled up to cover upper sash, the other shade pulled down to cover lower sash. Double hung window shade installation is especially suitable for schools, since it permits control of light and ventilation.

"Inter-Twill" — The Long Wearing Shade Cloth

An improved type of shade cloth with the strength in the twill. We believe it is the toughest and strongest shade cloth and will out-wear them all. It will stand abuse and rough usage. The threads will not "burn" when exposed to the sun's rays. It has special Interstate protective coating which makes it easily cleanable, reversible and long wearing. Soil is easily removed from its surface. The manner in which the twill fabric is woven insures the extra years of service. It is pure finished, and unfilled, no clay or other fillings used in the manufacture. Made in any color tone and in any combination of colors.

To darken auditorium—if total exclusion of light is desired, specify "LITE-PROOF" Shade Cloth. Shadowless and Light proof in all colors including light colors and white.

Also: Silver Screens for motion pictures.

JOHNS-MANVILLE

292 Madison Avenue, New York, N. Y.

NEW YORK CHICAGO CLEVELAND SAN FRANCISCO TORONTO

Acoustical Treatment

There are two classes of acoustical correction for schools and universities. The first requirement is that of auditoriums and large class rooms where it is desirable to have the words of speaker or teacher distinctly audible in every seat; or where music may be presented without causing disturbing echoes or reverberations.

The second class of correction is required for reducing noise to an undisturbing level in halls, corridors, study halls, gymnasiums, swimming pools, restaurants and kitchens. Science has proved by conclusive tests the advantages of quiet for study and, conversely, the injurious effect on the nervous system that results from constant exposure to noisy surroundings. This means that acoustical treatment is really a **health** measure.

Johns-Manville pioneered in the development of the science of sound control and have a large staff of acoustical experts available for consultation either on proposed buildings or existing school or college structures.

J-M ACOUSTICAL TREATMENT APPLIED TO THE ASSEMBLY HALL OF JOHN HAY HIGH SCHOOL, CLEVELAND, OHIO

There is a wide range of J-M sound control materials adaptable to the needs of any kind of room. They can be applied over any present wall or ceiling surface and interfere in no way with any desired decorative scheme. Many of the outstanding schools and universities of the country are today enjoying the benefits of Johns-Manville Acoustical Treatment.

Bonded Built-Up Roofs

The construction of most school and college buildings is admirably suited to the protection afforded by a J-M Built-Up Roof. These Roofs are constructed of alternate layers of asbestos felts and asphalt

THE TILDEN HIGH SCHOOL, BROOKLYN, PROTECTED BY A J-M BUILT-UP ROOF

with smooth or gravel surfaces. There are more than 20 types of J-M Roofs to select from. These roofs are applied only by trained roofing firms selected by Johns-Manville for skill and integrity. They are known as J-M Approved Roofers.

All worry and care about leaks, fire and upkeep is removed for a specified term of years. Depending on the grade of roof selected, a bond backed by Johns-Manville and the National Surety Company will be issued to the purchaser—for 10, 15, or 20 years.

Tile Flooring

In halls, corridors, lobbies, vestibules, lavatories, restaurants, gymnasiums, laboratories, locker rooms, or wherever there is heavy traffic, J-M Tile Flooring Type A is specially recommended.

These tiles are long-wearing, resilient, comfortable, stain-proof, fire-resistant, of pleasing appearance and low in cost. They are furnished in a variety of colors and patterns that provide floors adapted to every need in educational buildings.

LANDIS ENGINEERING AND MFG. CO.

CLOCK DIVISION

Waynesboro, Pa.

Products

ELECTRIC TIME and PROGRAM CLOCK SYSTEMS, complete with all accessories, such as Secondary Clocks, Program Machines, Push Button Boards, Time Stamps, Laboratory Clocks, Street Clocks, Tower Clocks, Time Recorders, Bells, Buzzers, Gongs, Time Switches, and Fire Alarm Systems for use in schools, colleges, public buildings, industrial plants where **accurate time and signal work** is desired.

INDIVIDUAL ELECTRIC SELF-WINDING CLOCKS operated from 110-volt a-c. or d-c. supply or single dry cell supply.

EMERGENCY LIGHTING SYSTEMS for theaters, schools or auditoriums.

ONE-MINUTE INTERVAL PROGRAM MACHINE
Four circuits, four-program, program-circuit selector, distributing board, individual and circuit push buttons.

Engineering Service

Detailed specifications are gladly furnished for architects or engineers for any particular installation, no matter how complicated your requirements.

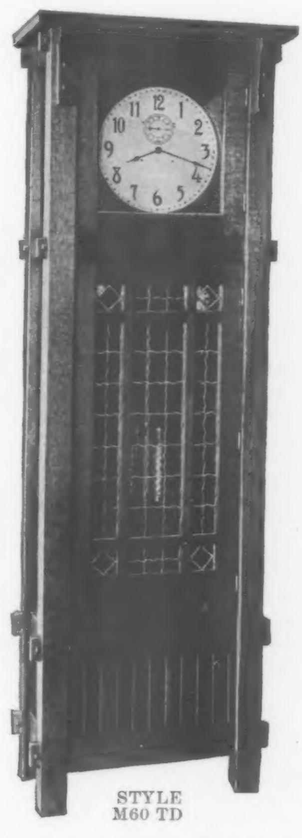
Secondary Clocks

Style 2M
8, 10, 12, 14, 18 and 24-inch Dials

The accompanying cut shows a typical Secondary Clock.

Master Clocks and Program Machines

The cuts to the right and left show typical Master Clock and Program Machine units.



STYLE M60 TD

SEE OUR COMPLETE CATALOG IN 1930 EDITION OF SWEET'S ARCHITECTURAL CATALOG, VOLUME D, PAGES 5413 to 5429, inclusive.

KERNER INCINERATOR COMPANY

1223 North Water Street

Milwaukee, Wisconsin

BRANCH OFFICES AND AGENCIES IN OVER 150 CITIES

Products

The KERNERATOR INCINERATOR for the prompt, safe and sanitary disposal of garbage and rubbish of all kinds by burning without cost. Made in various types and sizes to meet the requirements of small and large schools, colleges, academies, seminaries, and other buildings.

"CONVENIENT HOPPER DOOR SAVES COUNTLESS STEPS"

Importance of the Kernerator for All Types of School Buildings

The centering of education into larger units has increased the importance of the problems of safety and sanitation in the modern school building, whether this be city, county, or district school, high school, academy, college, university or school dormitories.

Safety

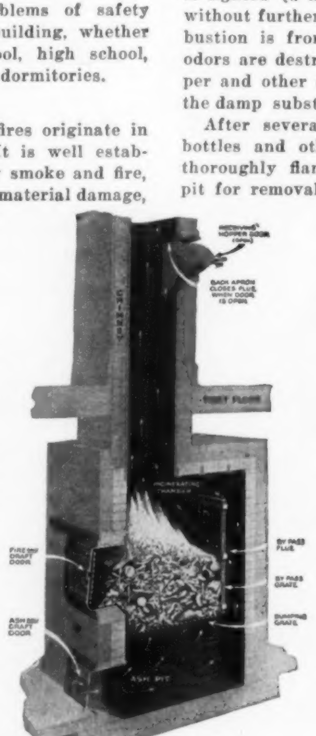
Statistics show that 75 per cent of fires originate in accumulations of basement rubbish. It is well established that in cases of panics caused by smoke and fire, the loss of life and limb far exceeds the material damage, especially in the case of fire-resisting construction. KERNERATOR provides for immediate and safe disposal of this highly combustible material.

Sanitation and Hygiene

Garbage receptacles are known breeding places for flies and vermin, as well as an attraction for rats. The KERNERATOR provides for immediate disposal of remnants of lunches, fruit skins, refuse from cafeterias, and lunch rooms. The location of hopper doors in girls' washrooms provides for the elimination of sanitary waste from this source, which otherwise must be deposited in receptacles or becomes a source of clogged drains.

Economy

The KERNERATOR eliminates the expense of labor, time and equipment in cleaning and replacing of garbage and rubbish cans; the necessity of daily collections of waste paper and sweepings, and removal to basement; frequent trucking of this material away from the building. It also cuts the cost of plumbing repairs due to drains stopped by sanitary waste from girls' washrooms.



SECTIONAL VIEW SHOWING INTERIOR CONSTRUCTION AND OPERATION OF KERNERATOR

Notice the draft reaching the point of burning through by-pass grate. The fire is always on top of the burning material, consuming offensive odors.

Kernerator Operation

No gas, coal or other commercial fuel is required. All waste, sweepings, waste paper, tin cans, broken crockery, bottles and garbage (if any) are placed in the door hoppers located on each floor. When the doors are closed this refuse falls down the flue into the incinerator combustion chamber. There it spreads out on the grates into a more or less separated and loose pile. This permits the constant flow of air up the by-pass flue to circulate through and around it causing a surprising amount of evaporation between burnings.

When the combustion chamber is nearly full the refuse is lighted (a match does it) and the whole mass burns without further attention. Due to the by-pass flue, combustion is from the top downward and all unpleasant odors are destroyed. The fire feeds upon the waste paper and other combustible material and gradually dries the damp substances so that they also burn to a fine ash.

After several burnings the ashes, along with cans, bottles and other non-combustible articles, which are thoroughly flame sterilized, are dumped into the ash pit for removal every few months.

Service

When preliminary sketches of floor plans are completed, a KERNERATOR representative will be glad to discuss with architects and school officials the matter of suitable equipment for each school. Call the nearest KERNERATOR representative or write to the Milwaukee office.

Further Information

Send for "The School Problem of Waste Disposal," giving full information and a list of KERNERATOR installations in schools.

A KERNERATOR FOR EVERY TYPE OF NEW OR EXISTING SCHOOL BUILDING

The KERNERATOR is made in three types:

FLUE-FED TYPE
BASEMENT-FED TYPE
ESTATE TYPE

with various sizes and layouts to fit the need of any city, county, or district school, high school, college, university or school dormitories. This applies to schools planned, building, or existing. Upon receipt of information as to the number of pupils, rooms and stories, the KERNERATOR representative will be glad to recommend the proper type and size of equipment.

MACBETH-EVANS GLASS COMPANY

LIGHTING DIVISION

Manufacturers of Lighting Glassware

Factory
Charleroi, Pennsylvania

"Galax"—An Entirely New Idea in Illuminating Glassware

The newest product of Macbeth Laboratories. An illuminating glass developed especially to meet the demand for highly efficient, semi-indirect lighting, ideal for the lighting of classrooms and auditoriums.

Another Step Toward Perfect Illumination

A decade ago, the open-top semi-indirect lighting bowl was hailed as the "ultimate" in commercial illumination. As far as the diffusion of light was concerned, it was, without doubt, all that could be desired. Its greatest disadvantage was the tendency to collect dust which impaired its efficiency.

Semi-indirect lighting soon gave way to diffused-direct lighting, produced by a globe of diffusing glass which entirely enclosed the lamp. This proved to be a great practical advantage. The enclosing globe eliminated difficulty from dust, and reduced cleaning to a minimum.

Semi-Indirect

And now comes Galax, still another step toward perfect illumination, if it does not in fact reach that apex of achievement itself. It is a refinement of the diffusing, enclosing globe idea, a return to semi-indirect lighting with its disadvantages eliminated.

A Unique Type of Glass

Galax is the newest product of Macbeth Laboratories. It is an entirely different and unique type of glass. A Galax enclosing globe is a single piece of homogeneous glass, dustproof, semi-indirect, with white reflecting, glareless bottom and slightly diffusing top of high transmission. Part of the light is diffused and transmitted through the bottom of the globe. The rest of the light is reflected back through the top and reflected from the ceiling.

High Efficiency

Galax Globes possess the advantage of high efficiency, low depreciation and easy maintenance. Dust cannot get inside and will not cling to the smooth outside surface.

For All Commercial Lighting

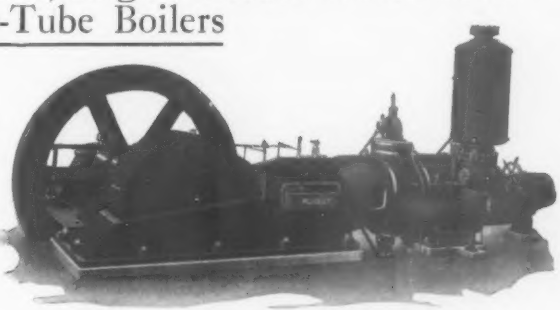
Galax is ideal for lighting offices, corridors, schools, hospitals, stores, shops and public buildings. Galax provides efficient semi-indirect light which is both glareless and shadowless.

MURRAY IRON WORKS COMPANY

Incorporated 1870

BURLINGTON, IOWA

Corliss and Uni-Flow Engines, Large Pumping Engines, Air Compressors, Steam Turbines, High Pressure Water-Tube and Fire-Tube Boilers



MURRAY UNI-FLOW ENGINE

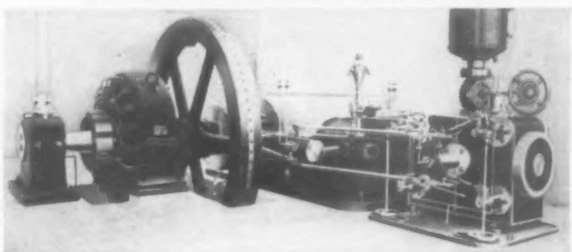
MURRAY WATER-TUBE BOILER

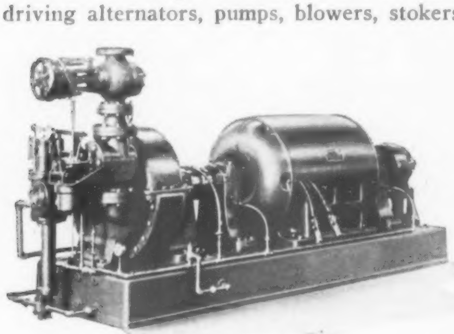
Murray Water-Tube Boilers are built with inclined or level drums and with solid plate headers front and rear, or with the style of rear header shown in the illustration just above. They are built in sizes from 50 to 1000 H.P. and for pressures up to 300 pounds, and to pass the inspection rules of all states and of the A. S. M. E.

In addition to the type of boiler illustrated above, we also build large Vertical Bent Tube Boilers for high pressures and operation at high ratings.

MURRAY TURBINE

Direct connected to alternator. By virtue of the Patent Nozzle construction and arrangement, the same unit may be adapted to wide ranges of steam conditions and power demands with constant high efficiency and economy. For driving alternators, pumps, blowers, stokers, etc.



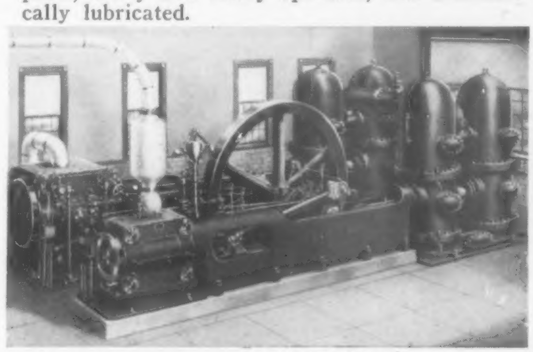


MURRAY CORLISS ENGINE

We work in harmony with the various electrical machinery manufacturers, therefore we can supply Murray engines and turbines combined with all makes of generators. There is no delay or confusion, as we know exactly the information necessary to be exchanged. Our governors are especially suited to parallel operation of alternators.

MURRAY PUMPING ENGINE

The horizontal, cross compound, condensing Corliss type of the crank and flywheel pumping engine is acknowledged to be the most durable and dependable pumping unit built. High in duty, low in maintenance, accessible in all its parts, easily and safely operated, and automatically lubricated.



Please mail us your specifications and calls for bids.

NATIONAL FIREPROOFING CORPORATION

General Offices

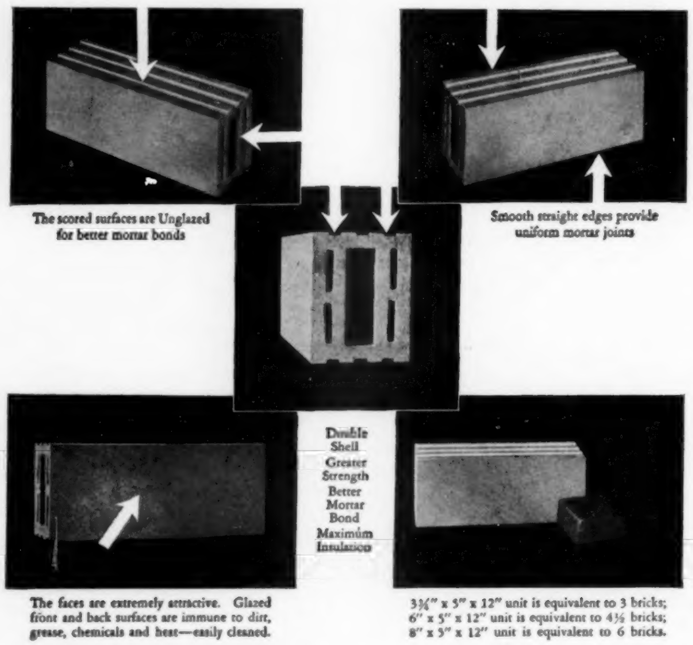
Fulton Building, Pittsburgh, Pa.

NEW YORK	CHICAGO	PHILADELPHIA	BOSTON
Chanin Building	Builders Building	Land Title Building	Textile Building

IN CANADA: National Fire Proofing Company of Canada, Ltd., Toronto, Ontario

FOR PERMANENT WALLS OF ENDURING BEAUTY . . .

Natco Vitritile is an ideal material for school use. Each unit laid forms a section of a vermin-proof, insulated, finished-face wall, on which no further surface treatment is required, then or ever. The smooth surface is easily cleaned and kept clean and sanitary, needs no paint, no plaster, no adornment of any kind. It is permanently free from the need for such maintenance, for the surface will last as long as the school building.



The scored surfaces are Unglazed for better mortar bonds

Smooth straight edges provide uniform mortar joints

Double Shell Greater Strength Better Mortar Bond Maximum Insulation

The faces are extremely attractive. Glazed front and back surfaces are immune to dirt, grease, chemicals and heat—easily cleaned.

3¾" x 5" x 12" unit is equivalent to 3 bricks; 6" x 5" x 12" unit is equivalent to 4½ bricks; 8" x 5" x 12" unit is equivalent to 6 bricks.

Natco Vitritile is furnished glazed, in beautiful blends of harmonious and subdued colors; enameled in straight colors and attractive mottle effects, with either high gloss or matt gloss finish; and unglazed, in a light cream color with an "eggshell gloss." Cove base glazed Vitritile is available in a rich chocolate, for contrast. Wainscot cap, sills, et cetera can be furnished in this shade, on special order. Split units are provided for furring.

Mechanically and structurally, Natco Vitritile is as admirable as it is beautiful. The practical considerations involved in promoting speedy, economical, strong and lasting walls were given equal weight with artistic aims.

The famous Natco double shell feature in the horizontal type tile provides built-in insulation in the walls. A multiple blanket of dead air is established, which curbs the passage of heat and cold. Strong and lasting horizontal mortar joints are assured through the unglazed scored surfaces provided in Vitritile at the top of the stretcher units.

Complete information will be gladly furnished any interested school official on request.

JOHN J. NESBITT

INCORPORATED

Manufacturers of Universal Heating and Ventilating Unit and Concealed Radiator and Cabinet Heater

MAIN OFFICE AND FACTORY

State Road and Rhawn Street, Holmesburg, PHILADELPHIA, PA.

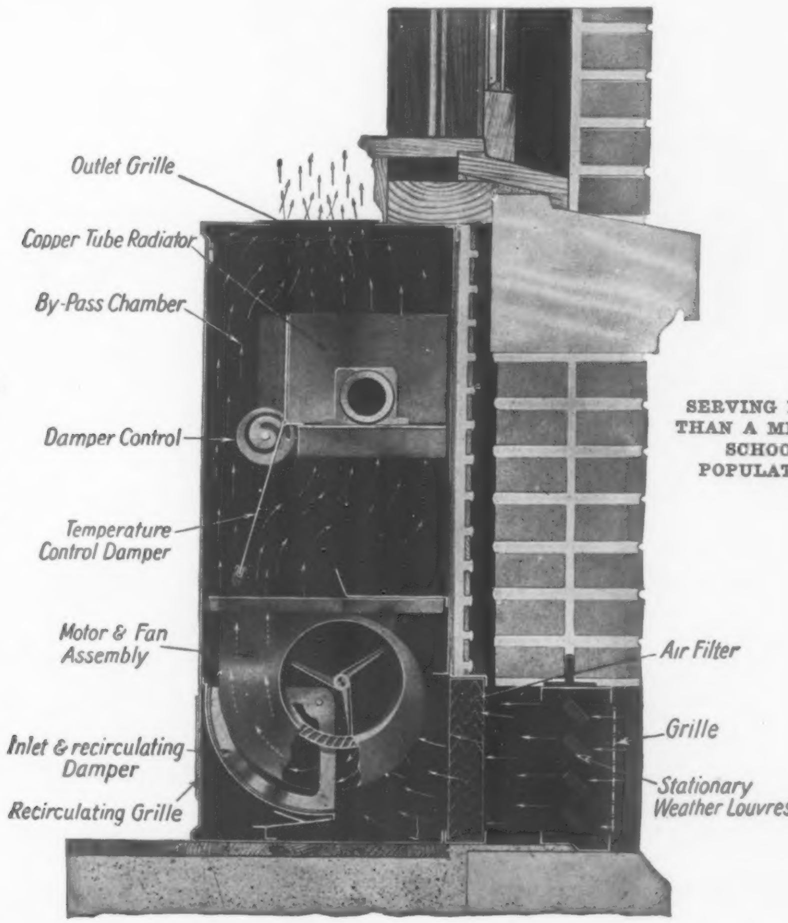
Branch Office: 11 Park Place, New York, N. Y.

NATIONWIDE SALES AND SERVICE THROUGH OFFICES OF AMERICAN BLOWER CORPORATION

Designed to meet the most exacting demands of present-day School House Construction, the UNIVERSAL UNIT embodies the most advanced scientific developments in proper Heating and Ventilating.

Many years of concentrated effort in this one field of endeavor has resulted in the UNIVERSAL Heating and Ventilating Unit being truly the standard by which all other makes are measured.

THE UNIVERSAL UNIT IS INSTALLED IN OVER TWO THOUSAND OF AMERICA'S FINEST SCHOOL BUILDINGS



SERVING MORE THAN A MILLION SCHOOL POPULATION

PADDOCK CORK COMPANY, INC.

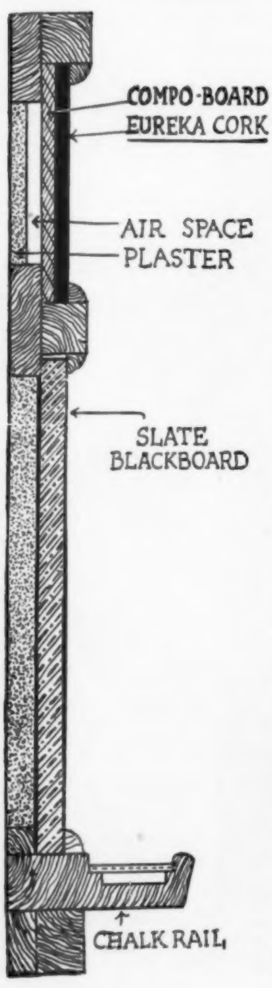
1209 DeKalb Avenue
Brooklyn, N. Y.

EUREKA CORK BULLETIN BOARDS

School architects and executives have been specifying Eureka Cork Bulletin Boards to such an extent that these boards are now standard equipment in more than 3000 schools. For classroom and laboratory use, these bulletin boards have been found to be satisfactory in every respect for displaying papers and exhibits neatly, attractively and without damage to walls and trim.

Architects' Specifications

CORK Bulletin Boards and Tacking Strips—All Bulletin Boards and tacking strips shall be of Paddock Cork, ¼" thick, sanded to a smooth even surface, green or tan in color, reinforced with burlap and securely cemented to three-ply compoboard with wood core. All lengths up to 14 feet and widths up to 4 feet shall be in one piece, and in two pieces above 14 feet and up to 28 feet in length.



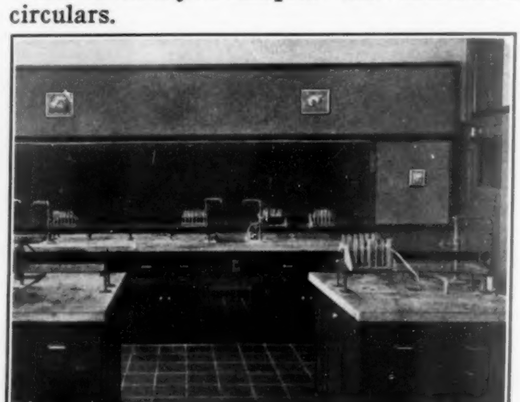
Instructions for Setting—Set grounds to hold Bulletin Board around edges, and vertically every 4 feet if boards are 3 feet or more high. Nail Bulletin Board to ground at top only, not at ends. When boards are more than 14 feet long and it is necessary to join two or more pieces, it is well to glue them together. There should be a vertical ground where the joint occurs to which the boards can be nailed for added strength. When the glue has dried, remove the excess with sandpaper. The joint will be unnoticeable.

On Doors—Cement Eureka Cork with burlap backing (no compo-board backing is necessary) to panels with Eureka Cement. Whenever possible, lay doors on floor and apply pressure to cork while cement is drying.

The illustration above shows Eureka Cork Bulletin Boards on walls and in the panels of the closets in one of the drawing rooms of the new DeWitt Clinton High School, New York City.

Below: One of the chemical laboratories in the same school, showing Eureka Cork Bulletin Boards above, and at the side of, the slate blackboard.

Let us send you samples—also illustrated circulars.

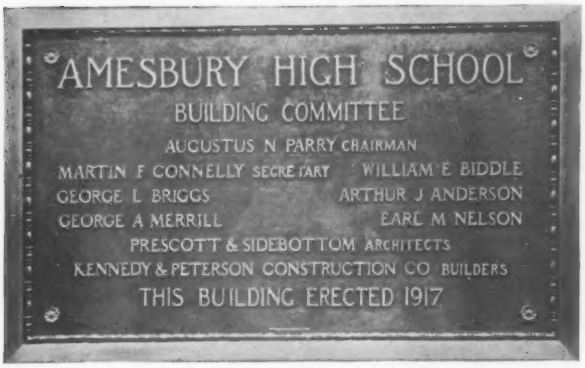


ALBERT RUSSELL & SONS COMPANY

BRONZE

MEMORIAL AND INSCRIPTION TABLETS

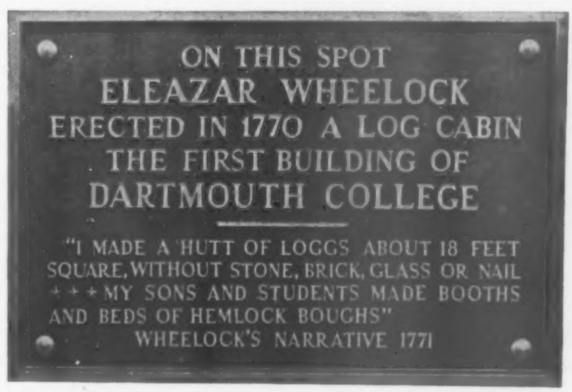
136 Merrimack Street, Newburyport, Mass.



Albert Russell & Sons Co., established in 1840, have specialized in the manufacture of solid cast statuary bronze inscription tablets for thirty years. We have furnished over five hundred bronze tablets for the Gettysburg National Park Commission, and have completed tablets for hundreds of private memorials. We can refer to satisfied customers in all parts of the United States.

We illustrate two typical marker tablets. We furnish plain or ornamental borders as desired. Sizes made to suit your appropriation.

Information as to the amount you desire to spend will aid us in making suggestions for your approval.



The Bruce Tablet illustrates a handsome memorial to a devoted teacher.

Let us assist you with
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Building Markers,
Memorials and
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SAMSON ELECTRIC COMPANY

Interior Telephone and Fire Alarm Systems

Principal Offices: Canton, Mass.

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BOSTON, MASS., 146 Summer Street
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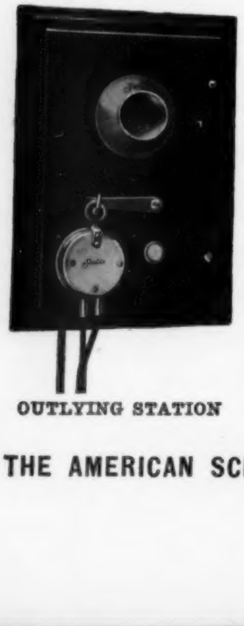
TELEPHONE SYSTEMS FOR SCHOOLS AND UNIVERSITIES

CENTRAL STATION

Efficiency in modern education requires instant and reliable communication between members of the supervisory staff. For more than thirty years the Samson Electric Company has specialized in the design and manufacture of telephone equipment for schools. Such installations have been and are giving dependable and economic service in large numbers of educational institutions throughout the United States.

ANNUNCIATOR

For small and medium size schools the most satisfactory service is provided by the central station type common talking system. The central station can selectively ring and talk with any outlying station, and any outlying station can ring and talk with central station. The outlying stations can ring and talk with each other by first calling central station. All calls to central station are registered on the annunciator drops and are reset electrically from the central station push-button block.



OUTLYING STATION

The Outlying Station is an attractive, most substantially constructed flush type all metal dust-proof telephone. It is equipped with transmitter mounted on adjustable arm for people of different heights and fitted with metal mouthpiece, dust-proof hook switch, metal back receiver with safety chain attached to cord and switch hook, and our standard buzzer.

For large schools and institutions we supply the selective talking lamp type switchboard system which requires the part time service of an operator. Literature or information will be promptly supplied on request.

FIRE ALARM SYSTEMS

BREAK GLASS BOX

It is universally recognized that dependable fire signal systems are necessary for school protection.

The dependability and suitability of Samson systems result from expert engineering and years of field experience. These systems are standardized for convenient specification by architect, ease of installation by contractor, and certainty of satisfactory operation by school authorities.

Closed circuit supervised systems offering various services, operating from the city's service or storage batteries, are found in the Samson line.

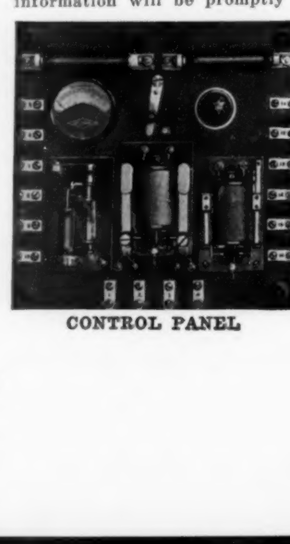
MASTER CODE BOX

The equipment shown illustrates the different units which comprise the Catalog No. 211 system. In this system the breaking of a glass in a signal station trips a master code box which operates a general alarm repeating a predetermined code six times upon single stroke gongs. Trouble of any kind is indicated by the continuous ringing of a special-toned vibrating bell.

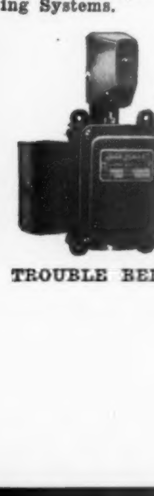
SINGLE STROKE GONG

Some of the Samson systems provide double electrical supervision by supervising both operating and supervising sources of power. Catalog and complete information will be promptly sent on request.

See page 369 for "PAM" Reproducing Systems.



CONTROL PANEL



TROUBLE BELL

THE THOMAS-SMITH COMPANY

CANTON, OHIO

BRANCHES IN PRINCIPAL CITIES

Electrically and Mechanically Operated Fire Alarm Systems Electric Bells and Signals

PRODUCTS

Manually Operated Fire Alarm Systems.

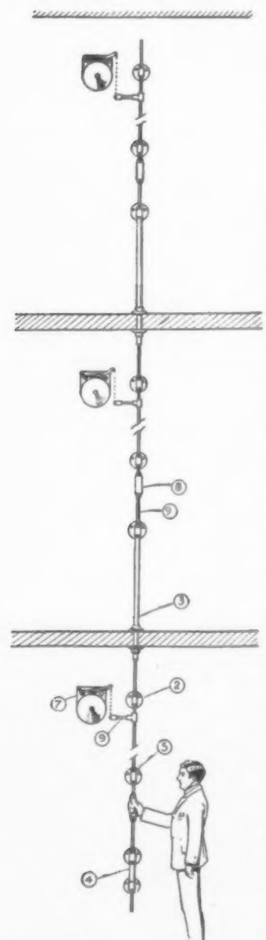
Electrical and Mechanical Operated Fire Alarm Systems.

Enclosed Type Vibrating Bells for Direct Current or Alternating Current.

Combination Electrical and Mechanical Bells, Aluminum Grids and Traffic Lights.

FIRE ALARM SYSTEMS

The Thomas-Smith Alarm System for Schools and buildings is approved by architects and conforms with state codes.



MANUALLY OPERATED FIRE ALARM SYSTEM

The Thomas - Smith Fire Alarm System is the only one with rigid rod connecting the alarms of the different floors of the building.

The supports are adjustable to take care of uneven walls or misalignment of succeeding floors.

The floor tube is adjustable to allow for floors of various thickness and extends up from floor to prevent rod from being bent.

Spring is totally enclosed and positive in action.

All supports and tubes are bushed with brass.

Enamel baked on. Red, Black or Buff finish.

The best bells made.

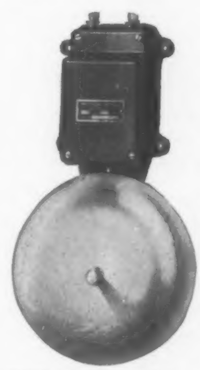
Handles of polished brass lacquered.

Operating rods of steel tube with chain stem properly proportioned and balanced.

Wood mats supplies for under supports and gongs.

Manufactured in both manually operated system and electrically and mechanically operated system which differ only in the method of operation.

Write for catalog and price list.



NOS. 6 JR. AND 6 D. C. AND NOS. 7 JR. AND 7 A. C. VIBRATING BELLS

THOMAS-SMITH LIBERTY BELLS

Thomas - Smith Liberty Bells cover all types and sizes from 3 inch to 20 inch, vibrating or single stroke, 110 volt, 220 volt, all standard transformer voltages, battery operation, direct or alternating current. Weatherproofed types furnished if desired at small additional cost.

All Thomas-Smith Liberty Bells embody the very finest of workmanship and materials and are approved by the National Board of Fire Underwriters.

Liberty Vibrating Bells are of the plunger hammer type. The No. 6-Jr. D. C. and No. 7-Jr. A. C. are made in 3", 4", 5" and 6" sizes and the No. 6 D. C. and No. 7 A. C. in 6", 8", 10", 12", 14", 16", 18" and 20" sizes.

The No. 12 A. C. Enclosed Type Single Stroke Liberty Bells are made in 5", 6", 8", 10", 12", 14", 16", 18" and 20" sizes. These bells contain no springs or moving parts except the plunger.

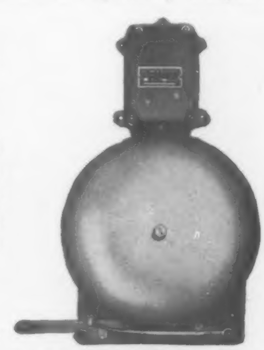
Nos. 86 D. C. and 87 A. C. Combination Electrical and Mechanical Bells combine the regular vibrating or single stroke line with the mechanical attachment. These bells are made in the 8", 10", 12" and 14" sizes and are especially adapted for fire signals.

THOMAS-SMITH ALUMINUM GRIDS

These grids are made to fit all sizes of bells and fit snugly at the base of mechanism over the shell and are bird-proof.

CATALOG

Write for catalog of Thomas - Smith Alarm Systems, Liberty Bells and Traffic Lights.



NOS. 86 OR 87 LIBERTY BELLS

Combination Electrical or Mechanical Bells

UNITED STATES RUBBER COMPANY

Flooring Division

Providence, Rhode Island

BRANCHES IN ALL PRINCIPAL CITIES

"U. S." RUBBER ASPHALTUM TILE FLOORING

General Characteristics and Advantages

A different and better composition tile floor designed and built for the specific purpose of producing a quality composition tile floor of outstanding merit at reasonable cost. "U. S." Rubber Asphaltum Tile is pre-cast in individual art tile structural units in various shapes, colors, and sizes, ready for laying with an asphalt, waterproof, paste cement. This tile is not only attractive and durable but easily and quickly laid. It is water-proof, acid-proof, sanitary, resilient, comfortable, non-slipping, and decorative in appearance. It will not buckle, crack, fade, curl, shrink, expand, or deteriorate with age.

"U. S." Rubber Asphaltum Tile

is particularly adaptable for use in schools (corridors, rooms and stairs); hospitals, offices and corridors and on stairs of office buildings; in toilets, wash rooms and locker rooms; public institutions; chemical laboratories; restaurants, dining rooms, lunch rooms, and around soda water fountains; bakeries, delicatessen shops, butcher shops, and in dining salons on ships; in basements and all spaces on, or below grade, jails, courthouses, and in all stores.

General Specifications for Laying

This Tile can be laid over sub-floors of any description that are smooth, solid and free from waves or irregularities. However, this floor should not be installed where there is heavy trucking, heavy point loads, or where there is excessive gasoline, oil or concentrated heat.

Moisture-proof

Resistance to moisture and dampness is one of the important factors of "U. S." Asphaltum Tile. It may be used for places below grade, such as cellars and basements; and for other locations which have proven disastrous to most other floor coverings.

Repairs

If repairs are ever necessary, the Tile can be easily and economically replaced since one or more units can be relaid without leaving an unsightly or patched appearance.

Designs

From the five colors and the various shapes available, it is possible to lay a "U. S." Rubber Asphaltum Tile in a variety of patterns and designs.

Colors

"U. S." Rubber Asphaltum Tile is furnished in five colors: Black, Red, Brown, Tan, and Green—in any of the following sizes.

Sizes

The standard thickness of all "U. S." Rubber Asphaltum Tile is $\frac{3}{16}$ of an inch. This is an important feature since it gives a more durable and more satisfactory floor than a thinner tile.

Cove Base—We furnish a 4″ and 6″ black rubber cove base. Tile made in the following sizes:

Square Tile—	6″x6″,	9″x9″,	12″x12″
Oblong Tile—	6″x12″,	9″x18″,	12″x24″
Border —	9″x27″,	12″x24″.	

WARREN TELECHRON COMPANY

Manufacturers of Telechron Time Equipment

GENERAL OFFICE AND FACTORY

Ashland, Mass.

DISTRIBUTORS AND REPRESENTATIVES IN PRINCIPAL CITIES

In Canada: Canadian General Electric Company, Ltd., Toronto, Ont.

Telechron

TRADE-MARK

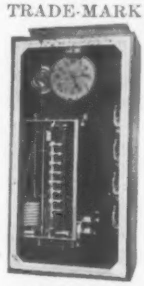
TYPICAL SQUARE WOOD-CASE CLASSROOM TELECHRON

The Modern Time-keeping System for Schools

Telechron timekeeping equipment for schools includes classroom clocks, program clocks, combination signal boards, polarized signal equipment and central control equipment for system installations.

All Telechrons are complete individual timekeepers and can be installed as individual devices or as a system on a separate wiring circuit.

All equipment operates directly from the 110 volt a.c. lighting current, the frequency of which directly controls their accuracy; . . . no local master clock to adjust, wind, or clean;* 110 volt current operation practically eliminates line losses and wiring problems; powerful self-starting individual synchronous motor-drive in each device prevents scattering; unaffected by dust, dirt or vibration; no batteries to service or replace; no clock relay complications. The largest single clock installation in the world operating from a single source of power is Telechron!



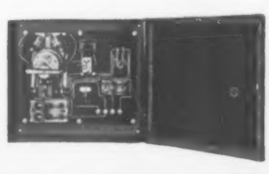
PROGRAM CLOCK FOR OPERATING CLASSROOM, CORRIDOR AND OUTDOOR SIGNALS

TYPICAL ROUND METAL-CASE CLASSROOM TELECHRON

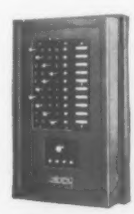
* By means of a Telechron Master Clock installed in the local power company station, regulated frequency is available for the accurate operation of Telechron timekeeping equipment.

COMPLETE SPECIFICATIONS AND RECOMMENDATIONS TO COVER YOUR PARTICULAR REQUIREMENTS WILL BE SUPPLIED BY YOUR LOCAL TELECHRON DISTRIBUTOR OR BY THE FACTORY . . . NO OBLIGATION

MARBLE CLOCK FOR AUDITORIUM, FOYER, ETC.



AUTOMATIC RESETTING DEVICE FOR CONTROL OF COMPLETE CLOCK SYSTEM



COMBINATION SIGNAL CONTROL BOARD FOR INDIVIDUAL CLASSROOM SIGNAL CONTROL

EAST OAKLAND, CAL., HIGH SCHOOL, WHERE A TYPICAL ADFR (DOUBLE FREQUENCY RESETTING) SYSTEM CONSISTING OF 66-406 SECONDARY TELECHRON CLOCKS, ONE 12-CIRCUIT PROGRAM, ONE NO. 93 AUTOMATIC RESETTING DEVICE AND ONE MOTOR GENERATOR FOR RESETTING IS GIVING EXCELLENT SERVICE

Section III

MODERNIZATION, MAINTENANCE AND INSURANCE

A State Program of Rehabilitation of Teachers Colleges

BY R. E. TIDWELL

STATE SUPERINTENDENT OF EDUCATION OF ALABAMA, 1927-29

THE normal schools of Alabama, now called teachers colleges, have passed through a crucial period during the past few years. As a result of more than a decade of neglect and the ever-increasing demands made upon them, it is not putting the case too strongly to speak of the present program as one of rehabilitation. This fact is brought out more strikingly when it is recalled that during the past ten years the annual expenditures for public education have trebled, and the amounts invested in buildings and equipment have nearly quadrupled, while the teachers colleges have stood still, or, rather, retrogressed. The only relief during this period was from student fees, which were increased from time to time in order to meet in some small measure the ever increasing difficulty of making the budget balance.

The Legislature of 1923 failed to provide relief from the serious situation which was found in the field of education. It was therefore an event of greatest significance when all those interested in education came together and formulated a joint program for presentation to the Legislature of 1927. It is not germane to follow the development of this unified educational program further except to say that, as approved, it involved an increase of more than $40,000,000 * for public education in the state, with reasonably adequate provision for the teachers colleges. The current appropriations to these institutions were raised to a half-million dollars, and provisions were made for capital outlay during the quadrennium in the aggregate for all institutions of over $2,000,000.

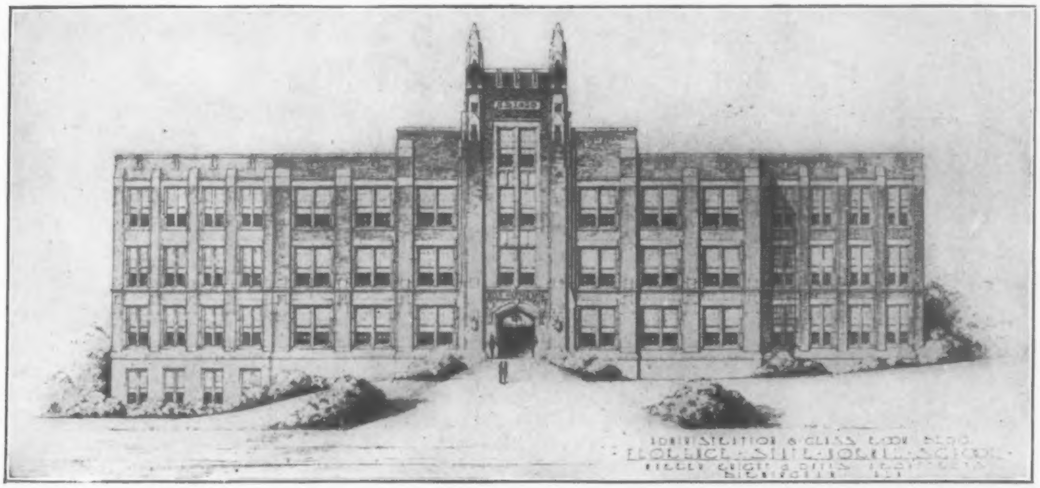
In arriving at the amount required for capital outlay, the presidents of the teachers colleges, in cooperation with the State Superintendent of Education and the Departmental Architect, A. F. Ditmar, presented to the State Board of Education estimates of the needs of the several institutions. These estimates covered the proposed development of the institutions over a period of years, but the report recommended asking only for that amount which would make it possible to meet the immediate and reasonable demands for training teachers for the public schools of the state. These estimates were approved by the Board and made a part of the quadrennial budget for education to be presented through the State Budget Committee to the Legislature. The State Budget Committee did not alter the figures presented by the State Board of Education, and the Legislature passed the bill without a formal protest in either branch, only one vote being recorded against it.

Landscape Architects Called In

With the passage of the educational bill, the State Board was faced with the responsibility of spending several million dollars of additional funds. The amount available for new buildings at the teachers colleges seemed even less adequate, now that the task of spending it to the best advantage was an immediate necessity. The sites of these institutions in most instances were gifts from the communities, made at the time of their establishment thirty to sixty years ago. The Governor, who is Chairman of the Board of Education, stated that the funds available, while substantial and affording much-needed relief, should be thought of as a part of a larger scheme including future developments. He also wanted the principles of harmony and beauty in the designs and plans, as well as of utility, to be observed in the programs of development at the several institutions. The first act of the Board, in seeking a solution of the problem, was to turn to experts in the matter of sites; their extent, utilization along general lines, order of arrangement, and beautification over a period of years.

The Board was fortunate in securing the services of a nationally and internationally known firm of landscape architects, Olmsted Brothers, of Brookline, Mass. A member of the firm, James Frederick Dawson, and an assistant, spent, all told, several weeks in the state during the spring

* A School Building Bond Amendment for public education for $20,000,000 failed of ratification by the voters.

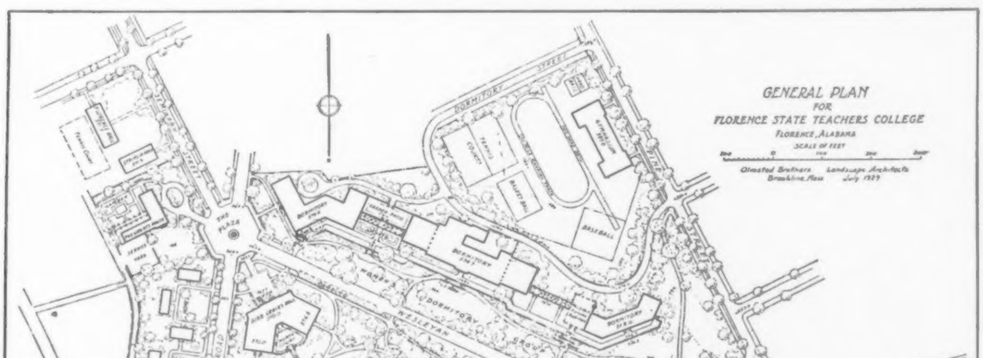


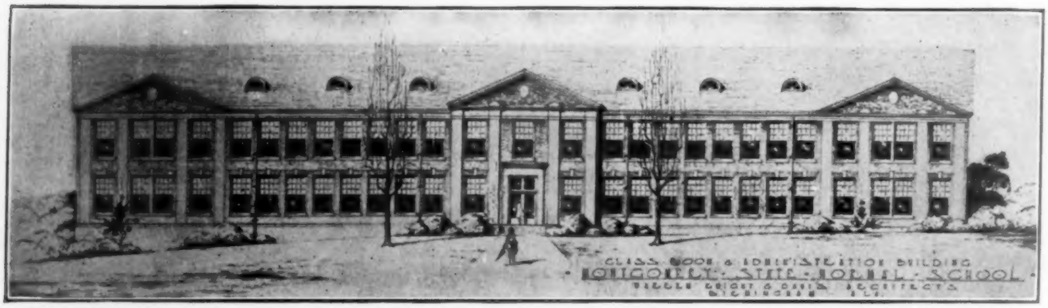
ADMINISTRATION AND CLASSROOM BUILDING, FLORENCE STATE NORMAL SCHOOL, FLORENCE, ALA.

and summer of 1928, visiting the sites and arranging for necessary maps and plats of the original and added holdings at each institution. Large and important additions to all sites were recommended. The Board gave its assent to this recommendation, even though it meant the reduction of the meager amount so much needed for additions to plant and equipment.

Building Survey Authorized

At this stage it seemed well to take a larger view of the task. After all, sites may be made adequate and attractive without adding much to the facilities of the institutions to offer adequate preparation for those who desire to be teachers. The presidents and the Superintendent had supplied the landscape architects with such plans as had been made. But the long look ahead involved another type of specialized service in the field of education. In order that no step be taken without bringing to bear on it the best available information, the Board authorized a building survey of the teachers colleges and directed the Superintendent to secure competent, professional





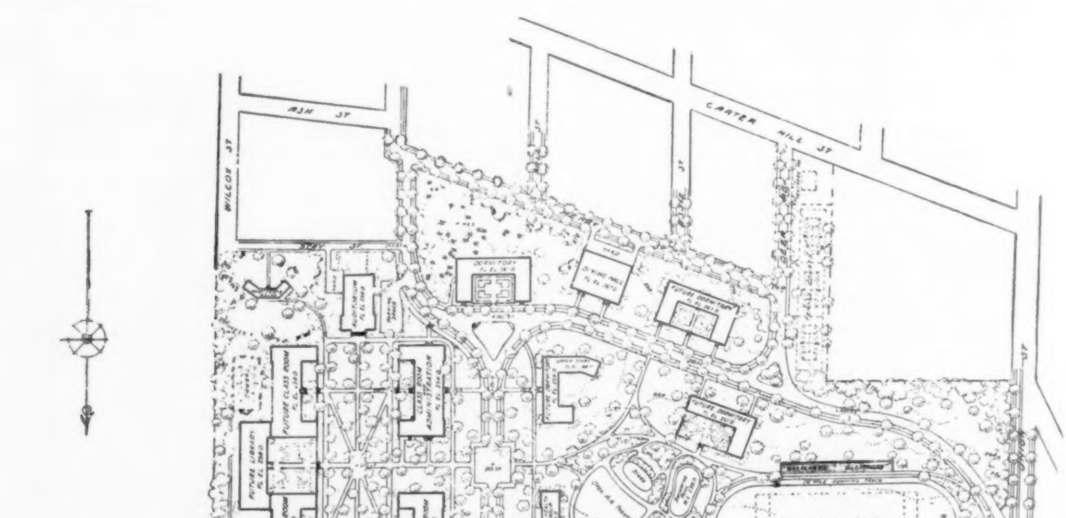
CLASSROOM AND ADMINISTRATION BUILDING, MONTGOMERY STATE NORMAL SCHOOL, MONTGOMERY, ALA.
The general plan of the campus is shown below

assistance for this task. Drs. George D. Strayer, N. L. Engelhardt and E. S. Evenden * of Teachers College, Columbia University, and Dr. F. B. Dresslar of George Peabody College, Nashville, Tenn., were asked to make this study.

This action on the part of the Board enabled it to bring together the educational experts and the landscape architects. All sites were visited by them, with ample opportunities for conferences. In adddition to the facts collected by these experts in the field, data were assembled and supplied to both groups on numerous phases of the teacher training problems in the state. The report of the education group was essential to the planning of a building program, and the landscape architects were required to furnish equally essential data as to the location and orientation of buildings before the architects could take any steps toward designing a suitable building.

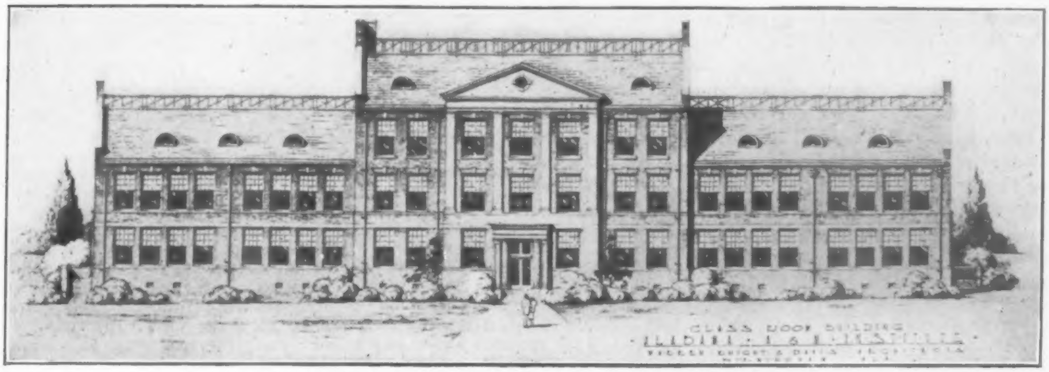
The Building Survey is too long to quote at

* Dr. Evenden was unable to participate in the field studies.



A PHYSICAL EDUCATION TRAINING LAYOUT

The above ground plan of the new State Normal School for Negroes, Montgomery, Ala., illustrates a remarkably efficient and compact recreation and health education unit. Olmsted Brothers, landscape architects, Brookline, Mass.



CLASSROOM BUILDING, ALABAMA A. & M. INSTITUTE

length. Briefly, it covered the following general fields:

1. The function of the state normal schools
2. The number of new teachers needed every year
3. The division of the load among the several schools
4. The present sites and buildings
5. The requirements in sites and buildings immediately and during the next fifteen years

It will be seen from the scope of the survey that a thorough analysis of the situation relating to teacher training in Alabama preceded the consideration of the present step. It was in this report that the Board found the answer to the problem of what would be the wisest expenditure of the available funds. Both groups, educators and landscape architects, recommended 100 acres as the minimum area for a site. As a result of this recommendation, more than 125 acres were added to the state's holdings at the six institutions. It was not feasible, within the limits of available appropriations, to add enough to give each institution a site of 100 acres, but desirable expansion of sites was provided everywhere, and in two instances, at Jacksonville and Montgomery, practically new sites were selected, near enough, however, to the old sites to permit the utilization of present facilities during the transition period of some ten or fifteen years.

In order to give some idea of the Building Survey Report, recommendations for one institution will be quoted:

Schedule of Accommodations to be Provided at Florence, in the Order in Which They Will be Required

1. Classroom and administration building. Plan to include an auditorium for seating 1,600. It may be that the money now available will not permit of the erection of the auditorium at this time.

2. Dormitories to accommodate all of the student body coming from outside of Florence; 1,650, estimated enrolment in fifteen years.

3. The completion of the training school.

4. The erection of a library building, including classrooms.

5. A physical education building.

6. The razing of the present classroom building and the erection of other classroom accommodations.

Certain conclusions are also quoted which reveal the comprehensive character of the Survey:

Expanding the Plant for All of the Schools

The money now available makes possible a beginning of proper housing for the normal schools of Alabama. A large investment is clearly indicated as essential during the period of the next ten years. In every case, additional dormitory facilities must be provided. In developing the general plan for the buildings on each of the sites, a maximum dormitory capacity equal to the total number of students estimated above for 1943 should be considered. In the case of each institution, a library building should be included as a part of the general scheme. For each school, a physical education building, with gymnasium, swimming pool, locker, and shower rooms, corrective gymnasiums, and the like, should be provided.

The question of providing dining-room facilities for the larger expected enrolments can be solved in either of two ways. Either a central dining-hall, or commons, can be erected for the whole school, or dining facilities may be provided in connection with each dormitory. There will be some saving effected if the central dining-hall is accepted as a satisfactory solution. The question of the desirability of the one policy as against the other should be seriously discussed with specialists in this field.

Training-school facilities will, of necessity, have to be increased as the enrolment advances.

Appropriations for the Normal School Plant

If the necessary building program is to be advanced, an appropriation of at least $2,000,000 must be made for each of the next three quadrenniums. Even this amount of money will only meagerly supply the facilities that will be needed. It is only fair to propose that the state consider its obligation to provide a plant for the normal schools on the same basis that it now appropriates funds for the State University, the State Polytechnic Institute, and the State College for Women. In the years which are past, the normal schools have been neglected. Surely there is no function of the state more important than that of preparing teachers for its public school system. This work cannot be adequately done without the large investment in plant proposed, nor can success be achieved without larger appropriations for the current budget of these schools.

It is also well to call attention to an appendix to the Report, embodying a set of standards* for measuring the effectiveness of plants provided for teachers colleges. By the use of these standards, proposed programs of development may be scored as to their adequacy in the matter of affording optimum facilities for effective use in the preparation of teachers.

* See The American School and University, Edition of 1929–1930, pages 52–55.

The next major responsibility presented to the Board was that of selecting an architect or architects. This was determined on the basis of satisfactory and varied experience in school architecture. The firm selected, Warren, Knight and Davis, Birmingham, Ala., has been and still is the official architect for two of the state institutions of higher learning, and has designed several buildings at the State University, in addition to having had extensive experience in handling building programs for cities. The state architect, Mr. Ditmar, retained general oversight of all building operations.

Services of Professional Consultants Retained

But again the Board was brought face to face with the need of expert advice. Neither the Superintendent nor the presidents of the teachers colleges were experienced in the intricate and technical problems of construction or the setting-up of proposals for the guidance of architects that would insure a maximum of accommodations and efficiency, with the lowest expenditure consistent with safety, permanency, and adaptability to the changing needs of a growing service. The Board authorized the employment of Dr. George D. Strayer and Dr. N. L. Engelhardt as professional consultants, to prepare, with the advice of the presidents, proposals for the approved building projects at each institution, and to pass upon and approve the plans and specifications before such were presented to the Board. This order of procedure was followed and plans and specifications were prepared, passed upon by the consultants, and approved by the Board. Contracts were let for new buildings as follows: Florence, heating plant, auditorium for training school, classroom and administration building, $269,485; Jacksonville, classroom and administration building, central heating plant, girls' dormitory, $332,-535; Livingston, girls' dormitory, classroom and administration building, gymnasium and auditorium for training school, central heating plant, $328,000; Montgomery, classroom and administration building, girls' dormitory, $292,973; Troy, classroom and administration building, girls' dormitory, $399,670; A. and M. Institute, classroom building, girls' dormitory, dining-hall, $257,-987; total contracts for new buildings, $1,880,650.

An examination of a typical proposal or schedule submitted to the architect will be of interest:

THE CLASSROOM AND ADMINISTRATION BUILDING, TROY

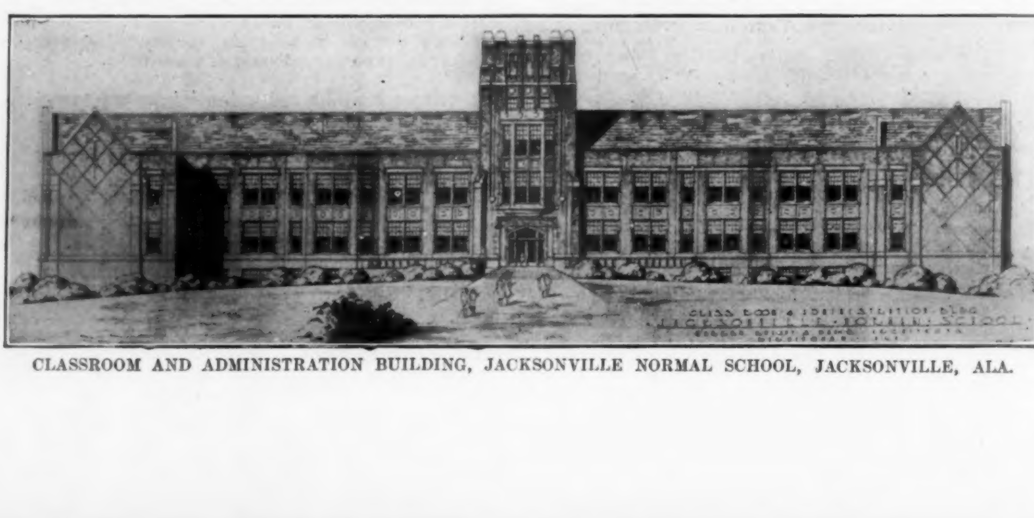
(1) Sixteen regular classrooms, 23 x 30 feet; (2) two large classrooms, two units each (a unit is 23 x 30 feet); (3) library, workroom, and office, four classroom units; (4) two general science laboratories, including office and preparation room, 23 x 45 feet, and two industrial arts rooms, 23 x 45 feet; (5) two home economics laboratories, 23 x 45 feet; (6) one faculty study room for men, half classroom unit; (7) one faculty study room for women, one classroom unit; (8) administration, three classroom units, providing (a) financial secretary, (b) registrar, (c) president's office, (d) secretary's office, (e) director of extension, (f) supervisor of field teaching, (g) vault; (9) toilets for men and women on each floor; (10) rest room for women; (11) lockers and showers for men and for women.

Development Part of a Larger Long-Time Program

The location of each building was selected in strict conformity with the plans of the landscape architect; in fact, the Board passed a resolution agreeing to adhere strictly to the general plans and designs submitted by the landscape architects for guidance in the present and future development of the plants and sites of these institutions.

It is well to bear in mind the extreme needs of these institutions in passing judgment upon the procedure followed and the results achieved. Also, it must be borne in mind that the present investment is only the beginning of a program of development which must necessarily extend many years into the future.

The writer believes that whatever contribution this article may make to the study of the building activities for the year 1929 will be found in the procedures followed by the Board. The Executive Officer of the Board of Education, the Departmental architect, and the presidents of the teachers colleges were familiar with general practices in matters having to do with the location of buildings, determining the limits of the capital expenditures available, selection of architects, passing on plans and the like. But the specialized nature of the building program of the teachers colleges demanded the services of a number of experts. The Board of Education followed the practice of the more intelligent business organizations by bringing to the assistance of its own staff and officers specialists in the several fields.



CLASSROOM AND ADMINISTRATION BUILDING, JACKSONVILLE NORMAL SCHOOL, JACKSONVILLE, ALA.

Organization and Equipment for Upkeep of Buildings and Grounds of a University Campus

BY I. W. TRUETTNER

MAINTENANCE INSPECTOR, BUILDINGS AND GROUNDS DEPARTMENT, UNIVERSITY OF MICHIGAN

DURING the past few years practically all large universities have found it necessary to have among their various departments one whose duties are the upkeep of the buildings and grounds. One of the largest organizations of this kind is that of the University of Michigan. Besides the maintenance work, our buildings and grounds department performs almost all the mechanical trades work on the various new buildings which are constructed from time to time.

This work on new buildings includes plumbing, heating, sheet-metal work and electrical work. Other work done wholly or in part is: painting; cabinet work for laboratory equipment, offices and classrooms; grading and landscaping of buildings; constructing walks; building new heating tunnels and extending old ones.

In maintenance work alone, this department takes care of 58 campus buildings, 24 nurses' homes, 21 residences, 117 acres of lawn and shrubbery, and 3½ miles of underground tunnels for the distribution of heat, light and power to these buildings. To accomplish this, a crew of about 350 employees are required normally, which has been increased to 500 at the present time, owing to the construction of a new women's dormitory, an elementary school, and an adddition to the Lawyers' Club, and the Legal Research Library; these projects costing nearly 4½ million dollars.

Eight Sub-Departments

The Buildings and Grounds Department is subdivided into the following sub-departments:

1. *Carpenter.*—The carpenter department takes care of carpenter work and operates the cabinet shop. The shop is equipped with the most modern machinery to construct any kind of cabinet work necessary for the University. About 20 men are employed.

2. *Painting.*—This department takes cares of all the painting in campus buildings, refinishes old furniture, and finishes the new cabinet work. About 15 men are employed.

3. *Electrical.*—All electrical repairs, such as rewinding motors, repairs to motors, rearrangement of lights in various rooms, the care of power-plant electrical equipment, the repairs to laboratory equipment, replacement of burned-out globes and fuses, and maintenance of electrical distribution and elevators, are all done by this department. About 20 men are required to do this work.

4. *Plumbing, Steamfitting and Sheet Metal.*—All repairs to heating, ventilation, plumbing, sheet metal and blacksmithing come under this department; also the care and distribution of heat and hot water through 3½ miles of tunnels to the various buildings. The shop is fully equipped

CABINET SHOP, BUILDINGS AND GROUNDS DEPARTMENT, UNIVERSITY OF MICHIGAN

PLUMBING, STEAM FITTING, VENTILATION, AND ELECTRICAL WORK IN THIS GROUP OF BUILDINGS WAS DONE BY THE BUILDINGS AND GROUNDS DEPARTMENT OF THE UNIVERSITY OF MICHIGAN

1. East Medical Building.—2,034,837 cu. ft.; 151,258 sq. ft. floor area; 30,449 sq. ft. radiation.
2. Physical Science (East) Building.—1,178,000 cu. ft.; floor area, 83,070 sq. ft.; 9,956 sq. ft. radiation.
3. School of Architecture.—1,195,188 cu. ft.; 76,223 sq. ft. floor area; 14,140 sq. ft. radiation.
4. Angell Hall.—1,178,000 cu. ft.; 83,070 sq. ft. floor area; 9,956 sq. ft. radiation.
5. University of Michigan Hospital.—5,577,000 cu. ft.; floor area, 437,700 sq. ft.; total radiation, 79,650 sq. ft.
6. University of Michigan Museums Building.—1,921,637 cu. ft.; floor area, 128,976 sq. ft.; radiation, 19,668 sq. ft.

with power drills, hammers, lathes, shears, high-speed steel saws, punches, rolls and the like. About 45 men are employed.

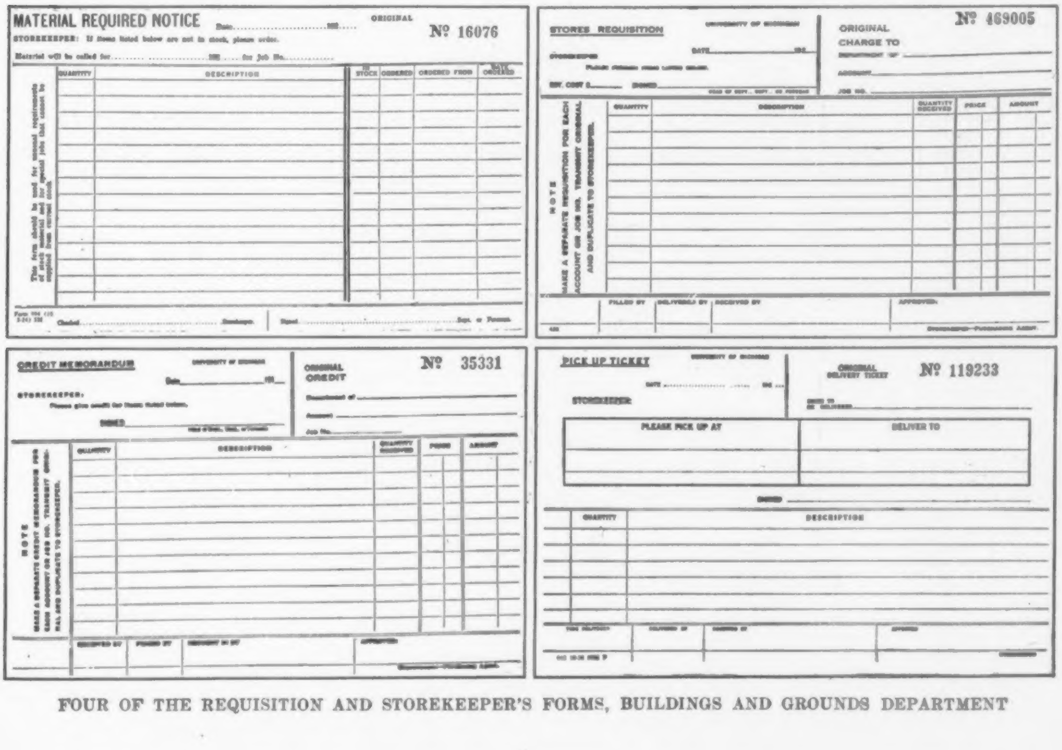
5. *Laborers.* — Lawns, shrubbery, plastering and brick work, cement walks, tunnel work, keeping walks in condition in the winter, unloading cars of lumber, cement and supplies for the Purchasing Department, are all done by this department. Normally about 60 men are employed.

6. *Janitors.* — This includes the janitor service for all the campus buildings, and the night watchmen. A total of about 90 are employed in this department.

7. *Power-Plant.*—Heat, light and power are produced in one of the most modern plants of its kind. Primarily, this is a heating plant, but instead of operating the boilers at 50 pounds steam pressure, the pressure is increased to 150 pounds and then reduced by passing through turbo-electric generators, and exhausting into the heating mains of the campus at about 8 pounds pressure. This plant floats on the line of the Detroit-Edison Electric Co. After the peak load has passed, the surplus power is turned into the Edison lines. The plant consists of eight 400-hp. boilers, two 500-hp. boilers, and two 1,000-hp. boilers, with another 1,000-hp. boiler being installed. The electric generating system consists of one G. E. 1,200-kw. turbo-generator, one G. E. 650-kw. turbo-generator, and one 2,500-kw. G. E. turbo-generator now being installed. During the year 1928-29, 44,500 tons of nut and slack, West Virginia coal, was burned to heat 55,550,000 cubic feet of building contents and furnish light and power. About 17 men are employed.

8. *Laundry.*—The University laundry is probably one of the largest of its kind. Some 90 employees wash, iron and mangle upwards of 30,000 pieces of laundry daily. The machinery is

PIPE LINES BEING INSTALLED IN A NEW CONCRETE TUNNEL, BUILT BY THE BUILDINGS AND GROUNDS DEPARTMENT
Width, 8 feet; height, 7½ feet; length, 1,650 feet



FOUR OF THE REQUISITION AND STOREKEEPER'S FORMS, BUILDINGS AND GROUNDS DEPARTMENT

UNIVERSITY OF MICHIGAN—BUILDINGS AND GROUNDS DEPARTMENT

Drawing No. .... Sheet .... Building .... Date ....

Subject ....

....

....

Sheet No. ....

ESTIMATE FORM

Prepared by ....

Quantity	Part of Work	Unit Price	Item	Total

Form 63

CONSTRUCTION ESTIMATE

UNIVERSITY OF MICHIGAN

Inquiry

No. ....

No. ....

Date ....

Building ....

Kind of work ....

Approximate Cost .... $ ....

Signed ....

SUPERINTENDENT OF BUILDINGS AND GROUNDS

SPECIFICATIONS

I. D. Req. No.	

UNIVERSITY OF MICHIGAN

BUILDINGS & GROUNDS DEPT.

TROUBLE REPORT

Date .... Dept. No. ....

Building .... Room No. ....

Location ....

TROUBLE

....

....

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....

....

Reported by ....

Telephone No. .... Time ....

Reported to ....

Work done by: ....

Job Number Used: .... Time Required ....

ESTIMATE AND TROUBLE REPORT FORMS, BUILDINGS AND GROUNDS DEPARTMENT

electrically driven, and hot soft water is furnished from the power-plant nearby. The machinery consists of nine revolving cylindrical washers, three extractors, four drying tumblers, and three large mangles. An overhead trolley system conveys the washed articles from the washers to the extractors, and thence to the drying tumblers. This machinery is on the first floor. Hand ironing and pressing is done on the second floor. Power presses are used for uniforms and other wearing apparel. A collar and cuff dryer with automatic conveyer and mangle are also located here. Contaminated laundry from the Contagious Hospital is disinfected in the basement before it goes to the washing machines.

Other Details

The department uses three 1½-ton delivery trucks, two 1-ton dump-trucks, three pick-up trucks, one small coupé for the Superintendent's use, and three work teams.

An electric railroad connects the power-plant and shops with the Michigan Central Railroad. Carload freight only is handled, such as coal, cement, lumber and building materials.

The office force consists of the Superintendent, E. C. Pardon; the Engineering Department, with a Chief Engineer, W. M. Roth, and three assistants, and the author as Maintenance Inspector. The bookkeeping for this department is under the direction of the Purchasing Department and consists of an accountant and two clerks. Each sub-department has a foreman.

Orders for various jobs, other than maintenance work, originate in the Secretary's office, where requisitions from the educational departments are received, approved, and forwarded to this department. Here the order is subdivided to the various departments after working drawings are made by the Engineering Department, if necessary.

These jobs are followed through, their progress and costs are noted at stated intervals, and when the job is completed it is billed out to the Purchasing Department, which deducts the amount from the budget of the department ordering the work. From these jobs, unit costs are obtained and filed for future estimating.

A majority of the jobs are estimated either by the Engineering Department or the Maintenance Inspector before an order is issued to proceed with the work. Approximately 150 jobs are in progress at all times. The buildings and grounds maintenance budget, together with new work orders, runs into approximately $2,000,000 for this year. Costs are had daily on all the various activities.

School Painting Practice in 174 Cities

A GREAT diversity of methods of school maintenance painting in use in this country is revealed by a survey of school painting practice recently conducted by THE AMERICAN SCHOOL AND UNIVERSITY. Questionnaires were sent to the business managers of the Boards of Education in all cities having a population of 25,000 and over. One hundred and seventy-four replies were received, and the information so far as possible has been tabulated.

Frequency of Repainting

The replies from the 174 cities to question number one, as to how frequently buildings are repainted, were as follows:

	Exterior	*Interior*
No regular program	46	46
Repainting unnecessary (brick)	3	
Every two years	4	2
three years	29	15
four years	25	23
five years	30	38
six years	9	16
seven years	2	8
eight years	2	6
ten years	3	3
No answer to the question	21	17
Total	174	174

Question two inquired whether maintenance painting is carried on throughout the year or is confined to the summer vacation period. Maintenance painting is confined entirely to the summer in 97 of the 174 cities; and 24 of the 71 cities which reported painting throughout the year indicated that most of the work was done in the summer.

Spray Painting

The third question concerned spray painting, and disclosed the fact that spray painting is used by 53, or nearly one-third, of the Boards of Education reporting. Four of the cities which do not use the spray method gave as their reason the fact that local unions objected. Several others stated that spray painting had been tried and not found satisfactory. A number, however, recommend it as efficient and economical.

"We have found that it is possible to carry on spray painting while school is in session," writes R. S. Wenzlan, director of the 96 schools in Toledo, Ohio. "We also learned that we were able to do satisfactory work with one coat of spray painting where two coats of hand work would be necessary. This means a considerable saving in maintenance cost."

The school system of Houston, Texas, with 113 schools, uses four spray machines and rents more when necessary. Pasadena, Calif., Quincy, Mass., and Fort Worth, Texas, report using spray painting for furniture and equipment, and Duluth, Minn., uses a small electric hand machine for radiation and metal work. W. Floyd Reams, Purchasing Agent and Superintendent of Properties (50 buildings) of the School Board in Richmond, Va., writes that 90 per cent of their painting is

hand work, but that one machine is used for basements, halls, fences, etc.

H. C. Daley, Business Manager of the Board of Education in Highland Park, Mich., supervising eight schools, writes: "Two years ago we bought one machine, and a year later we bought another. We have kept the two machines busy most of the time since last July 1. In that time we have painted the equivalent of more than 250 classrooms, besides exteriors of buildings, garages, etc. We expect to keep at least one gang going steadily the remainder of the year."

Summer Painting in Duluth

A method of procedure which is typical of that followed in a number of other cities is outlined by A. J. Ward, Chief Engineer of the Department of Education in Duluth, Minn., which supervises 50 buildings: "Early each spring buildings are inspected, and all repair work, including painting, is then estimated and classified. A certain number of buildings are selected for complete interior painting. Crews of painters, cleaners and helpers are organized to begin work immediately after the closing of the school semester. These men are paid by the hour, and all material is purchased through the Purchasing Department of the Board. The work is supervised by a first-class painter. We find this method very satisfactory, and the reason is that we can select our material, direct its application and select colors that are desirable."

Year-Round Painting

From Fitchburg, Mass., W. H. Keyes, Superintendent of Buildings (including 23 school buildings), writes that they keep up with their painting needs by employing painters the year round, doing corridor painting during the winter, exteriors in the summer, and classrooms in the vacation.

Four or five painters are employed the year round in Portland, Maine. Charles H. Perkins, Superintendent of School Buildings and Supplies, in charge of 45 buildings, writes: "In 1925 we started a painting program to paint all the exterior surfaces of school buildings every four years. The first four years we painted all our buildings two coats and re-puttied all windows, and last year we began to paint for the second time. We intend to paint one coat, which will give us a great deal more time to do inside painting. We plan to paint the inside of the buildings about every six years, and we do this mostly during the winter in schools where we have a spare room. The other schools are painted inside during the summer vacation."

Number of Men Needed

In Salt Lake City, Utah, with 54 school buildings, the maintenance painting is handled in the summer vacation period by two calcimine gangs of 16 men each, three paint gangs, one outside and two inside, totaling 16 men, and seven crews of wall cleaners totaling 14 men.

In Green Bay, Wis., writes Ira F. Clark, Superintendent of Buildings (including 17 schools), "We do all our painting during the summer vacation, using five men with brushes and one with machine. We paint three or four schools every year; that is, the interior surface of each school is painted once every four years. Then I have a crew of five men cleaning walls. Buildings that are painted this year will run for two years, and then we clean the walls; in two years more the walls are painted again. We use our janitors for this work."

The Practice in Bridgeport, Conn.

The program and practice of the maintenance department in Bridgeport, Conn., is described by John B. Wynkoop, Business Manager of the Board of Education: "It is only within the last two years that we have properly organized the Department of Maintenance as far as the painting program is concerned. A system of this size (48 school buildings and one warehouse) of course has about two men all during the year. In the summer we have five. In the case of large schools that are badly in need of painting, in order to bring the work up to date we try to let one or two buildings out by contract. When the weather permits, we have our permanent crew do the outside work. We paint our buildings, then serve their trimmings with white paint, at least two coats, especially the buildings that have not been served this way for a number of years, due to the fact that the frames are absolutely without oil, putty or paint. I absolutely believe that a permanent crew of painters should be employed by every school system in a city this size and larger, and that every building should be gone over at least once during a five-year period. I believe that the interior of our buildings, especially the corridors, should be painted in a light egg-shell finish and that this finish should be washable with soap and water if necessary."

Types of Paint Preferred

The advantages of hard-surfaced paint are discussed by R. T. Backus, Superintendent of Buildings of the Board of Education in Trenton, N. J.: "On our plaster walls, we have gotten away from the use of dead flat paints and are using hard-surfaced paints with a slight gloss or sheen to them. We find that this will permit wall brushing three tim s a year, and one job of complete washing before redecoration becomes necessary. This extends the life of a painting job in the average building three or four years. In other words, a building that formerly had to be redecorated in five years is really in better condition now at the end of eight years."

The Board of Education in Lorain, Ohio, has tested several standard brands of paints for hiding qualities, covering-capacity and washability, writes

W. A. Pillans, Business Manager, and also recommends semi-gloss paint, because "it's cleaner and can be washed. We use the best paint we can buy." New plaster is not painted for a year after construction.

A complete paint shop is maintained in connection with the repair department of the School Board in Cedar Rapids, Iowa. Clarence Hedberg, the Secretary, reports that paint is bought in carload lots and allowed to age properly.

Calcimining

Paint is used in new buildings in Muskegon, Mich., but in the case of old buildings, instead of rewashing painted walls, calcimining is preferred.

H. H. Linn, Business Manager of the 18 schools, writes: "We use calcimine in old buildings and paint in new. We are putting into effect a continuing program and keep painting all the time, trying to get around every five years. In summer we have certain work that can't be done during the year. Then we hire an additional crew. We believe we can wash off calcimine and put new calcimine on cheaper than washing a paint job to make it look clean."

Water-Color

Oil paint is superseding water-color in Johnstown, Pa.

Wilbert C. Wehn, Secretary of the Board of Education, supervising 24 schools, writes: "Until recently, we have been painting with water-color. In the last two years we have painted all new walls, that is, walls not previously painted though several years old, in oils. None of these jobs yet require washing. We are thoroughly convinced on oils, though we will continue to paint with water-color all walls previously painted that way, until we are compelled to wash the water-color off, due to its thickness and weight on the wall."

Treatment of Plaster

New school buildings are not painted for from five to eight years in Jamestown, N. Y., where Edward C. Price is Superintendent of Buildings (including 17 schools): "This gives the plaster a chance to thoroughly season and crack, after which time the cracks are properly repaired and walls painted. Our old buildings are repainted as necessary, usually from eight to ten years. Our most satisfactory method of having painting done is to prepare our own specifications, ask for bids on jobs, and award contracts to furnish labor and material with guarantees for paint and work."

Yonkers Requires a Guarantee

A bond guaranteeing the application of paint from peeling or discoloring for two years is required from any firm which paints for the Yonkers, N. Y., Board of Education, in charge of 32 school buildings. Three coats of paint are also required, states A. G. Corbin, Deputy Superintendent of Buildings and Maintenance, and the paint must be applied according to the manufacturer's specifications.

Painting by Repair Shop in District of Columbia

In the 168 schools in the District of Columbia, J. J. Crane, First Assistant Superintendent in Charge of Buildings and Grounds, writes that the following method is followed: "The District of Columbia maintains a repair shop, and all repairs to schools and painting of schools are performed by the repair shop, which is under the direction of the Municipal Architect's office. The greatest amount of work is performed during the vacation period, but painting is done all year. The amount expended is approximately $100,000."

Vacant Classrooms Utilized in Milwaukee

The practice followed in Milwaukee, Wis., which affects 109 schools, is reported by Frank M. Harbach, Secretary and Business Manager of the Board of Education: "For the purpose of expediting our maintenance painting we divide our school buildings into two classes: first, those that are not using all available classroom space or have vacant rooms; and, second, the buildings in which all available space is utilized. In the first instance, where we have extra space, we install temporary seats, either in the Assembly Hall or in vacant classrooms. Here classes are held while we completely renovate, including seats, two or three classrooms at a time. In this way classes are not held up because of the painting. In the second instance, where there is no room available for the installation of temporary seats, we wait until the vacation period, when we utilize a large crew of men for this purpose."

Time and Cost System Serves as Check

The scientific system used by the Board of Education in Sheboygan, Wis., embracing 11 schools, is stated by Alfred P. Balzer, Chief Engineer: "It is our policy to accurately measure and calculate the plaster, wood, pipe, radiator, etc., areas in rooms, corridors, etc., and file same with calculations, sketches and other data in a loose-leaf book for future reference. Formerly we did our own painting and established a time and cost system based on day labor for each kind of work. These figures are now used for estimating cost before bids are received, and serve as a check on contractors. The School Board buys paints, oils, etc., which have been tested in the schools and found to have merits. The contractors bid on the application of these paints only. Last year the application of these paints on plaster walls cost $1.91 per square of 100 square feet, and the application and material for oil graining cost 9 cents per square foot, complete with two coats of varnish."

Fundamentals of Insurance for School Properties

BY JOHN J. THOMAS

PRESIDENT, THE LLOYD-THOMAS CO., APPRAISAL ENGINEERS, CHICAGO, ILL.

A FEW years ago, one of the largest cities of the Middle West suffered from a severe tornado which left in its wake one million dollars' worth of damage to the public schools of that city. Imagine the consternation and position of the city board of education when it was discovered that because of a "self-insurance" plan which supposedly had eliminated the necessity for standard school-building insurance, there was available only $75,000 with which to pay the losses of over $1,000,000.

On the basis of adequate insurance under standard plans available—co-insurance, for example—the loss suffered in this one storm would have paid the total insurance premium for 100 years.

The Folly of Un-Insurance

Modern school buildings are large and costly structures. Their uninsured loss imposes a tremendous burden upon the taxpayers of the community. Not long ago, a supposedly fireproof technical high school in a well-known New England city burned down with a loss of $600,000 *not covered by insurance.* As the result of this costly warning, the various publicly owned properties of that city are now carried under a schedule covering 82 buildings with a total valuation of $5,636,000. Public officials charged with the responsibility of public property cannot afford to ignore well-established principles and practices in fulfilling their custodian obligations.

That the importance of intelligent consideration of school property insurance is recognized by educators and public school officials is indicated by the research now under way by the National Association of Public School Business Officials. A number of large and small school districts are cooperating in the work, the results of which will eventually be included in a handbook for use by officials handling school insurance programs.

The fundamental factor of insurance for school properties is the same as in business—getting complete and adequate protection at the lowest possible cost. Savings in fire insurance rates for public buildings can be made just as easily and as effectively as for industrial and business properties.

What Is Co-Insurance?

A form of insurance well established in industry and widely used in many fields, particularly that of marine insurance, is "co-insurance."

Co-insurance has been the great single factor in the reduction of fire insurance rates. Instead of being a hardship on the assured, it has been emphatically beneficial. Were not co-insurance in force on the majority of sizable risks in the country, insurance rates would necessarily be much higher.

To understand how savings are made in the buying, for instance, of fire insurance on the co-insurance basis, it is necessary, of course, to know something about fire insurance rates. Ordinarily, a building is insured at a "standard" rate, which means the basic rate for that building based on the amount of insurance the buyer would desire to receive in case of total loss. Co-insurance, on the other hand, is obtained under an arrangement whereby the person or organization buying insurance insures the property for its entire value, that is, on the basis of 100 per cent. By co-insurance, the assured warrants that he will carry insurance equal to 100 per cent (or 90 or 80 per cent, as the case may be) of the total actual cash value of the property.

In return for electing the co-insurance method, the assured receives a substantial reduction from the established premium rates plus the important advantage of more complete coverage. The reduction increases as the higher percentages of co-insurance are elected. The expression "co-insurance" comes from the fact that failure on the part of the assured to carry the proper proportion of insurance makes him a co-insurer with the company in sharing the loss.

To Illustrate

For instance, a person who insures his building for $80,000 under the 80 per cent clause, represents to the insurance companies that its actual cash value is $100,000. He gets the advantage of the reduced premium rates for carrying an amount of insurance equal to 80 per cent of the insurable value of the building.

Suppose that the property suffers a $60,000 cash value loss. The insurance adjuster, on making his appraisal, finds the "actual cash" value of the building at the time of the loss was $200,000 instead of $100,000. In order to get the benefit of the reduced premium rate, the assured had warranted to carry insurance to the amount of 80 per cent of the actual cash value of the building at the time of the fire. As a matter of fact, he was carrying only 40 per cent of the actual cash value of the building at the time of the loss.

Under the application of the co-insurance clause, the insurance companies pay $30,000 and no more—notwithstanding that the loss was $60,000 and that $80,000 of insurance was carried. And why? For the reason that under the co-insurance clause the assured had fulfilled only one-half of what he had warranted to do—namely, to carry insurance to the amount of 80 per cent of the actual cash value of the building, when in

fact he was carrying only 40 per cent of that value at the time of the loss.

Let us assume that a school board, under the co-insurance clause, insures a property the actual appraised value of which would be $100,000. Suppose, however, the board "estimates" the total insurable value to be $80,000 and carries that amount of insurance. This is $20,000 less than the actual cash value, or only 80 per cent of what the board has contracted to carry. If the property suffers a loss of $50,000, the school board will collect only 80 per cent, or $40,000; the penalty for not being fully insured would be $10,000.

Provable Values—Not "Estimates"—Are Basic

Under the co-insurance clause which is obtainable in some form or other in most states, it is vitally important that the insurable value *is not estimated*. "Estimates" are not accepted in adjusting losses. Proof of values is mandatory, because insurance is paid only on "provable actual cash" values. There is a wide variance between estimated insurable values and actual cash insurable values. "Find out before you burn out" is a slogan in which there is a world of advice for school board organizations.

The importance and the necessity of an accurate, dependable appraisal of all insurable property items is obvious where the co-insurance clause is used. There are many advantages in co-insurance, but this advantage is primarily based upon the appraisal of the insured property. Actually, co-insurance is dangerous if present-day actual cash values are unknown. On the other hand, co-insurance is beneficial if value facts are known and adequate insurance is placed in accordance therewith.

Therefore, what we might call the fundamental factor in the placing of insurance on school buildings on the co-insurance basis is to determine actual values of the buildings and properties to be insured. Incidentally, it is an established fact that school property in the United States is grossly under-insured so far as real protection to the community pocketbook is concerned.

A symposium of appraisals made by the Lloyd-Thomas Company of 106 school properties disclosed the following interesting facts:

On 81.3 per cent of the properties, the insurance carried was improperly distributed. Of this, one-third was actually wasted insurance because it was not properly distributed. Not a single piece of property even approximated the correct amount of insurance. Not one was over-insured. Under co-insurance, approximately 39 per cent of the schools showed a saving over and above the cost of insurance premiums, with greater coverage. The cost of appraising the property was absorbed in periods of four to six years. Approximately 33 per cent of the schools preferred not to carry co-insurance, or were prevented by some statute provision.

As the result of the true insurance value appraisals,

1 had to increase the insurance for adequate coverage 372%
27 had to increase the insurance for adequate coverage .... 200% to 225%
41 had to increase the insurance for adequate coverage .... 175% to 200%
12 had to increase the insurance for adequate coverage .... 150% to 175%
3 had to increase the insurance for adequate coverage .... 100% to 150%
17 had to increase the insurance for adequate coverage .... 75% to 100%
5 had to increase the insurance for adequate coverage .... 50% to 75%

An engineering appraisal survey of all the property under the jurisdiction of the public boards, in this case the school boards, gives the officials the basic information required for the buying of the adequate insurance.

Few school buildings are insured at their proper value. Very frequently values are based on contractors' estimates. Following is an interesting example of the advantage of co-insurance applied to the protection of school properties; this is from the files of the Lloyd-Thomas Company:

		Value	80% of Value	Rate	Premium
Broad St.	School	$73,253.12	$58,602.50	$1.11	$650.49
Dean Ave.	"	58,525.78	46,820.62	.90	421.39
15th St.	"	66,355.77	53,084.62	.81	429.99
Main St.	"	31,345.06	25,076.05	.81	203.12
High St.	"	197,483.53	157,986.82	1.74	2,748.97
Lakeview	"	138,339.44	110,671.55	.821	908.61
W. Main	"	87,324.55	69,859.64	.651	454.79
Jr. High	"	190,674.39	152,539.51	.951	1,450.65
Total		843,301.64	674,641.31		7,268.01

Previously, the board paid $4,371 for $293,000 worth of five-year term insurance. Based on the actual certified appraisal values—under the co-insurance method—this school board bought for an additional $2,897—a trifle less than 40 per cent increase—$381,041 worth of added protection, approximately 130 per cent increased protection. The original average rate was $1.824 per hundred. The additional insurance obtained under the co-insurance clause was obtained at an average rate of .76 per hundred, and instead of having from 43 to 44 per cent of the value protected before the appraisal, protection was increased to 80 per cent, as noted above. The cost of the engineering appraisal—a basis for the co-insurance—was a small percentage of one year's premium. So it will be seen that co-insurance brings decided advantages.

The investment of approximately $4,000,000,000 —$137 per student enrolled—in school property in the United States is a responsibility that bespeaks the careful attention and study of every school board and of every public-minded citizen. The community has a right to expect protection of its investment in facilities for education. Any program that does not include full protection of this investment—or of any other public property, for that matter—is illogical and unsound.

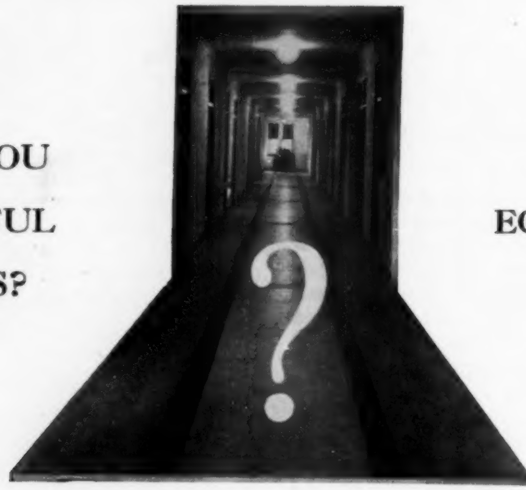
On our school boards the public is represented by business men, professional men and other individuals typical of the public. The problem of protecting school properties by insurance is a fairly easy one to solve. The agencies to make this protection ample at fair cost already exist.

CONTINENTAL CHEMICAL CORPORATION

Watseka, 310 Scott Street, Illinois

SERVICE BRANCHES AND WAREHOUSE STOCKS IN PRINCIPAL CITIES

HAVE YOU BEAUTIFUL FLOORS?



ARE THEY ECONOMICALLY KEPT?

HERE'S A SOLUTION TO YOUR FLOOR PROBLEM

No matter if your floors are new or have seen years of service—no matter what type of floor they are—they need protection from the daily onslaught of foot traffic.

CAR-NA-VAR
THE PERFECT FLOOR TREATMENT

Car-Na-Var provides the necessary protection from the onslaught of foot traffic—it forms a protective coating over your floor which will not check or scratch. The hard, impervious coating prevents stains and dirt from becoming imbedded into the pores of your floor and this lowers the maintenance cost.

Car-Na-Var is a liquid combination of fine varnish gums and high-grade waxes. It is easily applied with a mop and will dry in less than one hour after application. Car-Na-Var is quickly polished with a motor driven floor machine or weighted brush. The varnish gums give adherence, long wearing life and brilliant polish—the wax adds pliability which prevents scratching or marring. You may purchase Car-Na-Var in popular stains, such as, natural, light or dark oak, mahogany, walnut, green (bright), olive green, cherry and maroon.

RUBBER-VAR
FOR TREATING RUBBER FLOORS

This floor treatment with the Car-Na-Var solid content is especially prepared for use on floors of rubber, light colored terrazzo and soft composition. Recommended by the leading rubber companies for treating and protecting rubber floors. It is applied with a mop and responds to a hard, brilliant and water proof finish.

CLEAN-O-SHINE

Neutralizer for free acid and alkali left by previous cleaners. For use in conditioning floors before applying Car-Na-Var. Serving as a partial filler and also a hardener for cement, terrazzo, etc.

DE-TER-GO

An oil and stain solvent, De-Ter-Go will readily recondition old, oil-soaked and stained floors. Also used in preparing floors for Rubber-Var.

ARCHITECTURAL HALL, UNIVERSITY OF ARKANSAS
FAYETTEVILLE, ARK.
Floors Treated with Car-Na-Var
Jamieson and Spearl, St. Louis, Mo., and
H. Ray Burk, Little Rock, Ark., Architects

A PARTIAL LIST OF SCHOOLS AND COLLEGES USING

CAR-NA-VAR
THE PERFECT FLOOR TREATMENT

OR

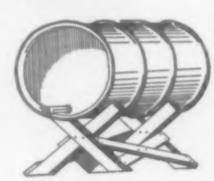
RUBBER-VAR
FOR TREATING RUBBER FLOORS

Shorewood High School, Milwaukee, Wis.
St. John's High School, Brooklyn, N. Y.
Ft. Wayne Public Schools, Ft. Wayne, Ind.
Board of Education, Melvindale, Mich.
Public Schools, Alexandria, La.
Public Schools, Aurora, Ill.
Public Schools, Hastings, Neb.
Public Schools, Indianapolis, Ind.
Public Schools, Hibbing, Minn.
Public Schools, Jacksonville, Ill.
Public Schools, West Milwaukee, Wis.
Public Schools, Muncie, Ind.
Public Schools, New Britain, Conn.
Public Schools, Pasadena, Cal.
Public Schools, Royal Oak, Mich.
Public Schools, Evanston, Ill.
Public Schools, Beverly Hills, Cal.
Public Schools, Hartford, Conn.
West Point (U. S.) Military Academy, West Point N. Y.
Harvard University, Cambridge, Mass.
Institute of Musical Arts, New York City, N. Y.
Pa. College for Women, Pittsburgh, Pa.
University of New Hampshire, Durham, N. H.
Dartmouth College, Hanover, N. H.
St. Catherine's School, Richmond, Va.
University of Arkansas, Fayetteville, Ark.
University of Michigan, Ann Arbor, Mich.
University of Notre Dame, South Bend, Ind.
Purdue University, LaFayette, Ind.
St. John's Military Academy, Delafield, Wis.
University of Southern California, Los Angeles, Cal.
University of Washington, Seattle, Wash.
Bellingham Normal School, Bellingham, Wash.
State Industrial Schools, Ogden, Utah
Centralia Jr. College, Centralia, Wash.
Williamette University, Salem, Ore.
Linnfield College, McMinnville, Ore.
Fordham University, Fordham Rd., N. Y.
State Teacher's College, Kearney, Neb.
Ohio State University, Columbus, Ohio

OUR GUARANTEE IS YOUR PROTECTION

We guarantee Car-Na-Var, Rubber-Var, Clean-O-Shine and De-Ter-Go to give satisfaction. If after our representative has given you a demonstration the results are not satisfactory to you it is only necessary to notify us. If we cannot help overcome your difficulty to your satisfaction you may return the unused portion of the Car-Na-Var, Rubber-Var, Clean-O-Shine and De-Ter-Go at our expense and we will credit you for the full amount of the purchase.

4 EASY STEPS LEAD TO PERFECT FLOORS



1. The handy drum container and faucet permits the pouring of CAR-NA-VAR in small convenient quantities. This eliminates wastage.

2. The liquid CAR-NA-VAR is then poured over the floor in just sufficient quantity to spread thinly.

3. A light mop then spreads the CAR-NA-VAR evenly and lightly over the surface. In a few minutes the floor is dry and ready for polishing.

4. CAR-NA-VAR will quickly take a lustrous varnish-like polish. Floors treated in this manner have a very low upkeep cost. If a floor machine is not available, use weighted brush.

FINNELL SYSTEM, INC.

Established 1906

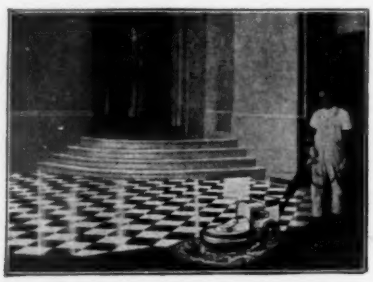
General Offices: 515 East Street, Elkhart, Ind.

FACTORIES

Elkhart, Ind. Hannibal, Mo. Ottawa, Can.

Branches in all Principal Cities of U. S. A. and Canada

The standards of today tolerate no compromises in the matter of providing clean and sanitary schools. It is the serious responsibility of all educational institution authorities to see that the essentials of cleanliness are not slighted or ignored.

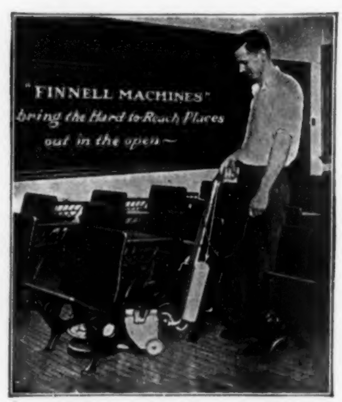


Clean floors are the backbone of the entire fabric of cleanliness and sanitation in all buildings. If the floors are not clean it is practically impossible to keep any other part of the building clean. With c-l-e-a-n floors a feature of your buildings there will develop a decided tendency to keep everything else clean. The effect of clean floors upon impressionistic youth is to inculcate into them habits of cleanliness and eliminate traits of carelessness and slovenliness.

The environment in which youth lives and develops affects him wholesomely or otherwise depending upon whether that environment be clean and proper or unclean and wrong. (A man does not cultivate a habit of throwing filth on to a clean floor. On the other hand a dirty floor develops and stimulates such habits.)

THERE IS BUT ONE WAY TO HAVE CLEAN FLOORS and that is to c-l-e-a-n them. Haphazard, slip-shod, old-fashioned methods of so-called cleaning have no place in the modern approved scheme of things. Those methods of years ago employed today are but excuses for cleaning and indicate a sad lack of appreciation of the importance of really clean floors.

School officials everywhere are rapidly installing the proven modern, efficient FINNELL Electric Scrubbing-Polishing SYSTEM and abandoning the inefficient old-fashioned hand and knee scrubbing, mopping and sweeping methods. They have found that electric machines and auxiliary units of floor maintenance equipment, insure spotlessly clean floors and incomparably more beautiful wax-polished floors at a great saving in time, labor and dollars.



FINNELL SYSTEM provides the scientific solution to all school floor cleaning and polishing problems. There are twenty different systems ranging in sizes from the requirements of the smallest school to the largest high school or university buildings —and at prices flexible enough to fit the budgets of all.

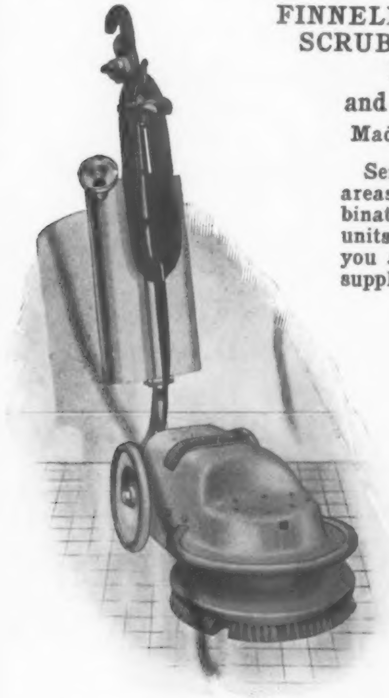
An investment in the right FINNELL SYSTEM for **your** requirements is an investment in a better and healthier manhood and womanhood.

FINNELL SYSTEM FLOOR SCRUBBING-POLISHING MACHINES

and Auxiliary Units

Made in Several Sizes

Send us your floor areas, and the right combination of FINNELL units will be outlined for you and full particulars supplied.



NO. 15A—SCRUBBER-POLISHER

NO. 17A—SCRUBBER-POLISHER

NO. 4A—MOP TRUCK

NO. 9—VACUUM MOPPER

NO. HC—SCRUBBER-POLISHER

NO. 10—WATER ABSORBER

FINNELL System equipment is used in hundreds of schools and universities everywhere. Ask for particulars or a demonstration. No obligations.

NO. 2D—MOP TRUCK

J. I. HOLCOMB MFG. COMPANY

Draper and Van Buren Streets

Indianapolis, Ind.

EASTERN OFFICE: 151 W. 25th St., New York City

The J. I. Holcomb Manufacturing Company is the largest manufacturer and distributor of:

CLEANING BRUSHES AND CLEANING CHEMICALS

The opposite page is a reproduction of page three of our catalog number sixty-one —it tells you where to find the answers to your cleaning problems.

For more than a third of a century thousands of customers have been coming to "Cleaning Headquarters" with both their usual and unusual cleaning problems.

Almost 70% of the Schools and Other Public Institutions of the Country are using Holcomb Cleaning "Tools"

We are endeavoring to warrant this YEAR AFTER YEAR nation wide patronage.

Catalog No. 61 tells you about more than one hundred cleaning brushes and cleaning chemicals. Your copy will be sent to you —on request.

SERVICE BULLETIN

Answering
YOUR CLEANING PROBLEMS

For the SCHOOL—COLLEGE

THE KENT COMPANY, INC.

Manufacturers of

KENT

Electric Floor Machines

and

Commercial Vacuum Cleaners

New York Office: 160 Fifth Ave. Boston Office: 423 Salem St., Medford
Cleveland Office: Builders' Exchange Bldg.

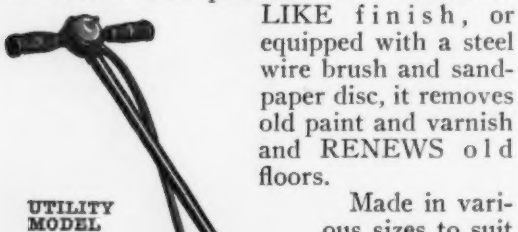
Main Office and Factory: 110 Canal St., Rome, N. Y.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

KENT Electric Floor Machines have been serving hundreds of schools and colleges thruout the country for the past twenty years, doing the daily scrubbing, waxing, polishing, floor refinishing and cleaning — lowering costs — saving time, making floor care EASY and PLEASANT —doing the work SPEEDILY and with ABSOLUTE THOROUGHNESS, at but a fraction of the expense entailed by manual methods.

You simply guide the machine—the motor-driven revolving brush, pad or disc does the work. Connect the machine to any electric light or power socket. Scrubs SPOTLESSLY clean, waxes THOROUGHLY and polishes to a MIRROR-LIKE finish, or equipped with a steel wire brush and sandpaper disc, it removes old paint and varnish and RENEWS old floors.

Made in various sizes to suit all requirements.



UTILITY MODEL

A trial will convince you.

Model A for use on small floor areas,—brushes 10-inch diameter, weight of machine on brush 35 lbs. UTILITY Model for use on medium floor areas,—brushes 10-inch diameter, weight of machine on brush 65 lbs. JCM Model, a heavier machine, especially adapted for large floor areas,—brushes 12 or 14-inch diameter, weight of machine on brush 85 lbs.

A FEW OF THE HUNDREDS OF SCHOOLS AND COLLEGES NOW USING THE KENT METHOD OF FLOOR MAINTENANCE

University of Florida, Gainesville, Fla.
Ohio University, Athens, Ohio
Academy Sacred Heart, San Juan, Porto Rico
University of Pennsylvania, Philadelphia, Pa.
Baylor University, Dallas, Tex.
Notre Dame Academy, Chicago, Ill.
Sacred Heart School, Springfield, Mass.
Central College, Pella, Iowa
Castle Heights College, Lebanon, Tenn.
Okmulgee High School, Okmulgee, Okla.
Independent School Dist., Watertown, S. D.
State College of Washington, Pullman, Wash.
Janesville Vocational School, Janesville, Wis.
Beloit College, Beloit, Wis.
St. Mary's College, Brockville, Que., Canada
Board of Education, Clarksdale, Ariz.
Eureka High School, Eureka, Calif.
Loyola College, Montreal, Que., Canada
Michigan State College, E. Lansing, Mich.
Cornell University Medical College, New York, N. Y.
Board of Education, Aurora, Ill.
Board of Education, Pella, Iowa
Lawrence College, Appleton, Wis.
Iowa School for the Deaf, Council Bluffs, Iowa
Associated Students University of Calif., Berkeley, Calif.
Indiana University, Bloomington, Ind.
Board of Education, Shelby, N. C.
Chilocco Indian School, Chilocco, Okla.
Johns Hopkins University, Baltimore, Md.
Harvard University, Cambridge, Mass.
Washington State Normal School, Ellensburg, Wash.
University of Montana, Bozeman, Montana
State University, Norman, Okla.
Lehigh University, Bethlehem, Pa.
University of Washington, Seattle, Wash.

Further details may be obtained by writing for our illustrated booklet.

THE

KENT
METHOD
OF
FLOOR MAINTENANCE

MADE IN TWO SIZES
JUNIOR MODEL
JUMBO MODEL

NO. IX OUTFIT—16-qt. capacity inc. wringer for mops up to 20 oz.

NO. DX OUTFIT—26-qt. capacity inc. wringer for mops 20 oz. and larger.

FOUR SIZES
18 IN., 24 IN., 30 IN., 36 IN.

JUNIOR OUTFIT—16-qt. capacity inc. wringer for mops up to 20 oz.

SENIOR OUTFIT—26-qt. capacity inc. wringer for mops 20 oz. and larger.

The KENT Method is daily serving hundreds of Schools and Universities.

Write for Particulars

NO. 300—30-Gal. Capacity
NO. 600—60-Gal. Capacity

THE SELIG CO.

Atlanta, Georgia — Dallas, Texas

Manufacturers of

Disinfectants, Insecticides, Soaps, Sanitary Products, School Supplies

Since 1896 we have been serving schools and institutions with their requirements in disinfectants, soaps, insecticides, sanitary products of various kinds, janitors' supplies, and other school supplies such as drinking fountains, water coolers, paper cups and towels, electric dryers, blackboard erasers and crayons, etc. That this service has been thoroughly satisfactory is evidenced by the tremendous growth of our business—a growth, in fact, so large that today our company is recognized as one of the largest manufacturers of these lines.

Whenever your school is in need of any of these supplies, we shall appreciate the privilege of quoting on your requirements. If in need, at any time, of information or advice on problems of sanitation or janitorial maintenance, consult our technical staff, which is at your service without charge. Put your problem up to us, and we'll do our level best to help you solve it efficiently and economically.

The Importance of Installing Adequate Sanitary Facilities in Every School

The matter of sanitation and cleanliness in educational buildings is one that is receiving an unusual amount of attention at this time, as evidenced by the fact that such well-known organizations as the American Public Health Association, the Cleanliness Institute, the Massachusetts Institute of Technology, the Metropolitan Life Insurance Company, and the Plumbing and Heating Industries Bureau, have been cooperating this past year on the compilation of standards for the selection, installation and administrative use of sanitary equipment in educational buildings.

More than ever before, school officials are realizing that adequate sanitary facilities are essential in every educational building, if the students are to be protected against the spread of disease, and if they are to form lifelong habits of cleanliness.

Training is not enough, if the students have not the facilities for keeping clean.

We are prepared to serve schools with a wide variety of sanitary products. Many of these you will find listed on this page. Mention those in which you are interested, and we will send you complete information without any obligation on your part.

List of SELIG Products

Selco Anti Freeze
Blackboard Lithoplate
Liquid Blackboard Slating
Erasers
Eraser Cleaners
Blackboard Cloths
Brushes for all purposes
Brooms—Chamois
Crayon—Chalk
Paper Cups and Holders
Garbage Cans
Trash Burners
Drinking Fountains
Water Coolers
Liquid and Powder Cleansers
Pine Cleanser
Scrubzol
Selco Toilet Cleanser
Wash Kleen
Paint and Varnish Cleaner
Coal Tar Disinfectants
Pine Disinfectants
Cresol Disinfectants
Chlorine Disinfectants
Deodorizing Blocks
Flo Vapor Blocks
Rosodor Blocks
Dust Pans
Dusters
Drain Pipe Solvent
First Aid Cabinets
Fire Extinguishers
Kleno Furniture Polish
Floor Oils and Polish
Liquid and Paste Floor Wax
Se-Fly-Go Insecticide
Floor Mats
Mops—Mop Wringers
Lawlor Scrubbing Machines
Solar Receptacles
Sanitary Napkins
Paper Napkins
Liquid Toilet Soap
Liquid Soap Dispensers
Toilet Paper and Fixtures
Paper Towels and Fixtures
Electric Dryers
Waste Baskets and Receptacles

Write us for complete information.

Let us assist you in solving your maintenance and sanitation problems.

This incurs no obligation on your part.

THE FAY COMPANY

7–11 East 31st Street, New York, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

Manufacturers of

FAY

ELECTRIC FLOOR MACHINES

Products

FAY Electric Floor Machines (Champion and Jumbo Models)

FAY Attachments for Cleaning, Waxing, Polishing, Sandpapering, Refinishing

FAY Liquid Cleaner, FAY Liquid Wax, etc.

General Information

A FAY Electric Floor Machine is equivalent to a crew of five to fifteen men and will do work that men cannot possibly do by hand. For greater efficiency clean your floors the FAY-WAY. It will give you the maximum satisfaction with the minimum of cost and effort.

Service

We will be glad to demonstrate the use of our machines on your own floors in order to prove without doubt that FAY-WAY is the best way. Just advise us of the kind of floors to be treated and we will do the rest.

THE MACHINE WITH 120 LBS. PRESSURE ON THE FLOOR

Specifications

THE CHAMPION MODEL

Built of heavy aluminum castings to withstand exacting service; gear-driven and ball-bearing throughout; brushes 10" in diameter. Motor: ¼-horsepower, continuous load, of either direct or alternating current. For schools, colleges and universities where small areas are cared for. Tested and approved by Good Housekeeping Institute, The Herald Tribune Institute and many other laboratories.

Weight on brushes in operation, 55 pounds.

THE JUMBO MODEL

Built of heavy aluminum castings to withstand exacting service; gear-driven and ball-bearing throughout; brushes 14" in diameter. Motor: ½-horsepower, continuous load, of either direct or alternating current. For heavy duty in large schools, colleges and universities: where large floor areas are cared for, it has no equal.

Weight on brushes in operation, 120 pounds.

Free Trial Offer

Where it is impossible for us to make personal demonstrations we shall be glad to forward a FAY Electric Floor Machine for free trial on conditions to be furnished on written request.

A SMALL LIST OF SCHOOLS AND COLLEGES USING FAY MACHINES

Board of Education, Trenton, N. J.
Board of Education, Rochester, N. Y.
Board of Education, Wellington, Kan.
University of Pennsylvania, Philadelphia, Pa.
Amherst College, Amherst, Mass.
Sheridan Linn High School, Patchogue, L. I.
Brearley School, New York, N. Y.
N. Y. Preparatory School, New York, N. Y.
Shore Road Academy, Brooklyn, N. Y.

WRITE FOR LITERATURE AND FULL INFORMATION OF OTHER SCHOOL AND COLLEGE INSTALLATIONS

HILLYARD CHEMICAL COMPANY

EXECUTIVE OFFICE AND FACTORY

St. Joseph, Missouri, U. S. A.

Branch Offices and Warehouse Stocks in All Principal Cities

Shine-All

Trade-Mark Reg.

Shine-All is the one cleaner which meets the requirements of all types of floor surfaces —rigid or resilient.

Shine-All is the efficient neutral cleaner free from alkali, ammonia, lye and harmful abrasives . . . it cleans, polishes and preserves in one operation . . . cutting labor costs.

Floor Maintenance Consultants

Every Hillyard Floor Maintenance Engineer has practical knowledge of the care and treatment of all types of floors.

His services are yours for the asking. A consultation will gladly be arranged without the slightest obligation to you.

Hillyard Helps

"Modern Floors — Their Maintenance," is a treatise published by Hillyards with the cooperation of leading floor manufacturers. "Sanitation of Today," describes the entire Hillyard line. Write for your free copies today.

Hiltonian

Scrubbing and Waxing Machine

The new electric floor machine for scrubbing, waxing and polishing all types of floors.

The simple construction . . . triangular twin interlocking brushes give perfect scrubbing action and ease of operation.

TWO SIZES

"SENIOR"
20-Inch Scrubbing Surface

"JUNIOR"
15-Inch Scrubbing Surface

Hillyard Wood Floor Products

HILLYARD WOOD PRIMER

The perfect foundation for all finishes. Uniform results obtained on large areas, quickly and economically. Preserves the original color of the wood.

DIAMOND FLOOR FINISH
Trade-Mark Reg. U. S. Pat. Off.

For wood, linoleum and cork carpet — produces a tough, lustrous finish. Quick drying and easy to apply. Diamond floor finish marks another step forward in floor maintenance.

GYMNASIUM FLOOR FINISH

Produces non-slippery, durable and sanitary floor, easy to maintain. Withstands hard and constant wear—insures a perfect non-slippery surface for rubber-soled shoes—universally used by leading schools, universities and athletic clubs.

NEUTONE FLOOR DRESSING
Trade-Mark Reg. U. S. Pat. Off.

The perfect dressing for wood floors. Replaces the oil and greasy types of floor dressing.

Neutone produces a hard, firm, lustrous finish which will not collect dirt or become discolored from traffic.

TRACKLESS FLOOR DRESSING
Trade-Mark Reg. U. S. Pat. Off.

Three important functions in wood floor treatment are accomplished economically with "Trackless":

1. Clears away surface grime and dirt
2. Leaves a secure filling and sealing coat
3. Gives a lustrous finish extremely easy to keep clean and sanitary

THE HUNTINGTON LABORATORIES, INC.

HUNTINGTON, INDIANA

FROM HUNTINGTON LABORATORIES

REX PINE LIQUID SCRUB SOAP

REX PINE Liquid Scrub Soap is recommended for use on school floors and woodwork because it has three distinct superiorities:

1. It is a liquid and therefore dissolves instantly. No scum or chunks of soap remain undissolved.
2. It is non-alkaline and will not injure linoleum or painted surfaces.
3. It contains 30 per cent of pure soap.

REX PINE is a thick liquid which dissolves instantly in water, producing an efficient cleaning solution. Most scrub soaps are sold in the form of a jelly. The fact that a soap has jelled does not indicate that it is pure soap, but may indicate the presence of strong sodas, because soda jells a soap with a very low pure soap content. REX PINE is made of pure vegetable oils and potash only. The soap content is a little more than 30 per cent, and to this is added about 5 per cent of pine oil, which gives REX PINE its agreeable piney woods' odor. REX PINE contains no caustic soda whatever, and is therefore safe to use on linoleum floors and woodwork.

Shipped in clean, strong drums with faucets—supply easily handled without muss or bother.

LINO-SAN—THE LIQUID LINSEED SOAP

We have spent years and much money in our laboratory to produce a liquid soap which would dissolve instantly in hot or cold water and eliminate entirely all harmful effects to painted or enameled finishes.

LINO-SAN saves time, costs less, and preserves finish.

LINO-SAN is especially desirable for cleaning desks, woodwork and partitions as well as linoleum or other soft texture flooring.

SAMPLES

Write for prices and samples of REX PINE Liquid Scrub Soap and of LINO-SAN. Test them, and satisfy yourself.

REX CLEANING CRYSTALS

REX Cleaning Crystals dissolve in water, producing an economical cleaning solution that will serve practically every purpose for which soap is used and many which soap will not take care of. As a strong grease solvent it is especially valuable. Despite its powerful action on grease and dirt it is perfectly harmless to the hands. For use in school cafeterias and for cleaning painted walls, windows or tiled floors, this product has no equal. It leaves no streaks because it cleans without making suds. It works equally well in hard or soft water.

There's a circular on each of these products. Shall we send you the circulars?

SAMUEL LEWIS

School and Institution Supplies

73 Barclay Street, New York, N. Y.

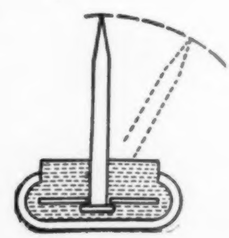
"STAKMORE" FOLDING CHAIRS

"APOLLO" THE BETTER FLOOR WAX

For over forty years we have catered to the largest Schools, Colleges and Institutions throughout the country.

Customer satisfaction has always been our object and it has helped materially toward our success.

TUCKAWAY FOLDING LIBRARY LADDER
"It Folds Up Flat"



"GLIDE-O" CHAIR GLIDES
Used by Schools Everywhere

Illustrated here are just a few of the many items we carry in stock. We can most always make prompt shipments to any part of the United States.

May we send you a Free copy of our complete catalogue? It contains prices and illustrations on almost everything pertaining to Building Maintenance.

THE "CURRO-ART" FIREPROOF WASTE BASKET

TOILET AND TOWEL PAPER

Every Purchasing Agent or Superintendent should have a copy handy for reference.

Do it To-day!

Send in your name and address and we will mail one promptly to you.

ALSO BRUSHES, MOPS, SCRUB CLOTHS AND 2,000 OTHER ITEMS!

MASURY-YOUNG COMPANY

76 Roland St., Boston, Mass.

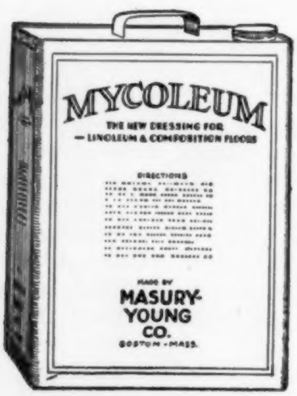
MYCO Products

The Masury-Young Co. was established in 1857—seventy-three years ago. Throughout this long span of years we have served leading American educational institutions in many parts of the country. Year by year our roster of customers has increased, because of the quality and value in Myco products and the efficiency of Myco service.

Myco products meet practically all school and university needs in cleaning, sanitation and janitors' supplies—economically and efficiently.

MYCOBLOX AND MYCOZONES

Mycoblox are used in urinals to displace ammoniacal odors caused by faeces and organic matter. Pleasant aromatic odor. Mycozones are used in toilets for the same purposes—best results when used in Mycozoners.



MYCOLEUM

Mycoleum cleans, polishes, preserves and deodorizes at the same time. Used on linoleum, composition, wood, tile, cement and all other kinds of floors as well as a polish and cleanser on furniture. Approved by Armstrong Cork Co. and other leading manufacturers of floor coverings. Mycoleum is the ideal cleanser and dressing for schools and universities.

Send for Catalog

New 1930 catalog contains information about the complete Myco line—which includes products to meet every school and university need in cleaning, sanitation and janitors' supplies. Myco products lead in efficiency and economy. You should not be without a copy of the Myco Catalog. Send for one today. No charge. Exclusive New England distributors for the famous Lawco line of wastebaskets, containers, incinerators, bathroom cabinets, etc.

SCOTT PAPER COMPANY

Manufacturers of

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Thirsty Fibre Towels packed 150 to the carton, 25 cartons to the case

Attractive towel cabinet at left—white or olive green—holds 250 towels

Thirsty Fibre Towels

Scott Thirsty Fibre Towel service provides you a constant supply of fresh, clean, individual towels.

It saves you money, too. Waldorf Towels cost only $1.75 per person per year. ScotTissue Towels cost very little more.

Either is more economical than adequate cloth towel service.

More economical than ordinary paper towels, too. They're actually 10 times more absorbent—because of the "thirsty fibres" and the special double fold. They're softer, too, and strong even when wet. Send for a free sample carton of ScotTissue or Waldorf Towels. No obligation.

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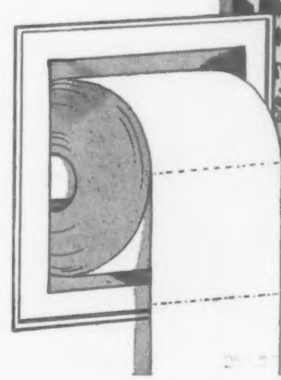
Specially packed for large consumers, ScotTissue actually costs less than so-called "cheap" toilet tissues.

It's scientifically processed to satisfy strictest medical requirements.

Many institutions in all parts of the United States are installing it because they find it both safer and more economical than coarse, inferior tissues.



Each roll of ScotTissue contains 1000 sheets with clean-cut perforations which tear easily and evenly. One hundred rolls are packed per case

THE SPENCER TURBINE CO.

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THE SPENCER SYSTEM OF VACUUM CLEANING

The Spencer Multistage Turbine System of Vacuum Cleaning has met with the approval of architects and engineers everywhere, and has been installed in more than 10,000 buildings, including more than 1500 school buildings.

Cleaner Schools—For school buildings, the Spencer System has introduced a new standard of cleanliness. Numerous tests have demonstrated that the Spencer System removes 25 to 50 per cent more dirt in pounds under similar conditions than other methods.

No Dust—The Spencer System removed dangerous dust. Even the finest dust is drawn in by large volumes of air under heavy vacuum and goes down to a container in the basement.

Speed—The Spencer System saves time. The Spencer System usually shows a saving of 20 to 30 per cent of the operator's time on bare floors. In cleaning other parts of the school building, however, such as rugs, walls, chalk trays, etc., there can be no comparison. If the janitor were to attempt to clean these parts as well as the Spencer System does, it would require two to ten times as much work!

For Cleaning Erasers and Chalk Trays—The Spencer System, instead of scattering the great bulk of the chalk dust on the floor, provides a method of cleaning erasers and chalk trays that is rapid, sanitary, easy and thorough. The janitor has only to attach a special tool and move it across the surface of the eraser or the chalk tray.

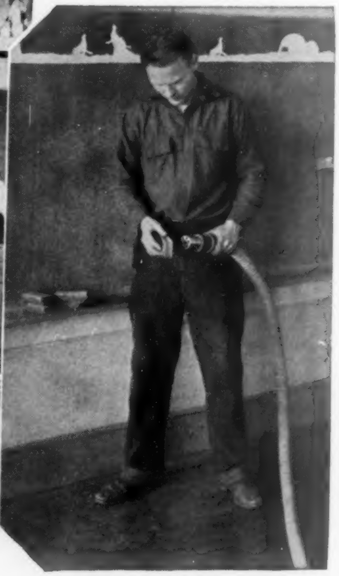
Cleans the Boiler Room—This system cleans boiler room floors—removes dust and soot from pipes and draws soot out of the boiler tubes, often saving the whole cost of operation in this one item alone.

BOOKLET

A number of Spencer-cleaned schools are illustrated in our booklet. A copy of the booklet and a complete list of Spencer-cleaned schools will be sent on request.

CLEANING CLASS-ROOM FLOOR

CLEANING CHALK TRAYS



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For years we have specialized in the manufacture of Paints, Enamels, Varnishes and Roof Coatings for the protection of large buildings. During this time we have developed many coatings for Educational Institutions.

The Tropical Surface Saver

From an advertisement in *The Saturday Evening Post.*

Our whole energy is bent toward the improvement and development of our maintenance products. It pays to buy from specialists like ourselves, because you are sure of getting the most suitable coating for every surface and one which will give long wear and satisfaction.

We maintain a staff of men covering the whole country, who are known as "Tropical Surface Savers". They have been trained in paints and painting problems and know how to analyze painting conditions.

The "Tropical Surface Saver" in your locality will be glad to apply his knowledge to your problems. This is a service of which you can avail yourself free of charge.

B & P Tung Oil Enamel

This enamel is designed especially for use on walls and ceilings subjected to frequent washing and exposure to steam and water.

It is excellent for toilet rooms, shower baths, swimming pool rooms, hallways, cloak rooms and similar places.

B & P Tung Oil Enamel owes its durability, long life and washability to the Tung Oil which it contains. Tung Oil, which comes from far-off China, produces in the enamel a porcelain-like surface that is repellent to water and unusually elastic.

This book, which is given free to school officials, was designed especially to help those who are responsible for the maintenance and upkeep of school buildings.

Among its pages you will find information about protecting and decorating difficult surfaces like swimming pools, shower rooms, laboratories and toilet rooms. It also contains pictures of many educational institutions where Tropical Protective Coatings are now in use, and descriptions of those products, which are designed for school buildings.

Another useful feature of this book is an alphabetical index of all surfaces that need protection around Educational Institutions, and opposite each is the name of the Tropical Product that is designed to decorate and protect that particular surface.

This book will make a valuable addition to your information file, as there are many times when you will find that it will come in handy.

Tropical Floorkote

Floorkote is a companion to B & P Tung Oil Enamel and it has many similar characteristics. It is designed for wood, concrete or cement floors and for that reason is built to withstand hard wear and abrasion from constantly walking over it.

Floorkote also contains Tung Oil, which gives it a tough water-repellent surface that can be washed and scrubbed without injury. This makes it ideal for floors in wash rooms, showers and swimming pool rooms.

Section IV

LANDSCAPING AND UPKEEP OF SCHOOL GROUNDS

Recent Trends in Landscape Architecture for School Grounds

BY A. R. NICHOLS

VICE-PRESIDENT, AMERICAN SOCIETY OF LANDSCAPE ARCHITECTS

THREE HUNDRED years ago, Francis Bacon wrote: "Men come to build stately, sooner than to garden finely, as if gardening were the greater perfection."

America has learned to build beautiful and efficient school buildings. She is, however, still in the process of learning to place these buildings in a proper setting, both with relation to other buildings and with relation to the softened and dignified effects that proper planting can give to the framing of these buildings. The ever increasing appreciation of educational advantages has had marked influence on the speed of growth of our schools and colleges. The administrative boards have been forced into a period of expansion which has resulted in a building program of considerable magnitude.

The school executives having the welfare of their institutions at heart must be alert to recognize that such a program of expansion may easily lead to the gross error of congestion and haphazard arrangements, unless careful planning is provided to safeguard the ultimate results. Thoughtful pre-vision is required to insure the orderly and efficient continuing development. Due emphasis must be given to the importance of the proper setting of individual buildings, the logical relationship of these units, the demands of future growth, the provision of space for outdoor physical recreation, and, most highly important, opportunity for mental recreation, or, in other words, the creation of an environment that reflects the desire for beauty in all things.

Education consists, not only of fundamentals, but also of the culture that comes from a proper environment. It is the duty of every school to make its surroundings esthetically attractive. The last two decades have resulted in much progress in this respect. There is a breaking-away from the old type of barren grounds with few trees and unrelated playgrounds, and there is evidence of some definite and excellent thinking in regard to the importance and arrangement of the grounds themselves. Their buildings are being located in an orderly, logical relationship, and their grounds are being given warmth and interest by luxurious planting.

It has therefore been most encouraging to note in the recent examples of physical growth in our schools and colleges a broad and comprehensive vision of the esthetic values to be gained through a careful study of the ultimate whole. In some cases the emphasis has been necessarily given to a building group toward which the institution might expand. In other cases, it has been the emphasis of physical recreation and the provision of playgrounds and athletic fields. However, in either of these cases, or in the combination or both, there is the need of embellishment to soften the structural units and to give to the entire composition an environment of beauty.

From Alabama

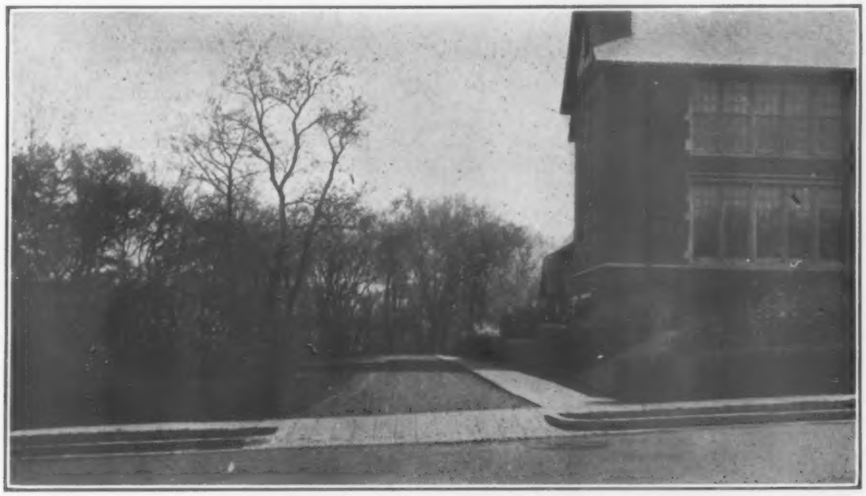
The general plan for the State Normal School for Negroes, at Montgomery, Ala., by Olmsted Brothers, landscape architects, reproduced on page 166, is a splendid example of the proper planning for expansion of school grounds, giving definite locations for the building group, and yet providing sufficient space for athletic requirements, and affording a definite unity in arrangement, with a feeling of order prevailing throughout the plan. Only as our schools and colleges thus plan for their growth and expansion, can we avoid confusion, and work toward a definite result in order and beauty.

From New Jersey

The illustration of the Tuscan Road School, Maplewood, N. J., the grounds of which have been developed by Brinley and Holbrook, landscape architects and engineers, shows the perfection with which an English type of architecture can be adapted to a school building. The landscape architects have taken this beautiful building and built a setting of lawns and shrubs which soften and bring out the character of the school. The illustrations showing the drive and the hedges show a type of landscape architecture adequately fitting for this project. The attractive

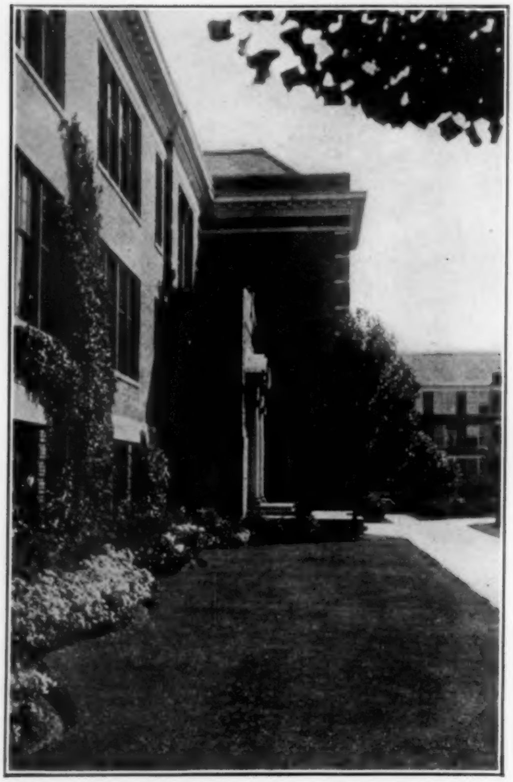
THREE VIEWS OF THE TUSCAN ROAD SCHOOL, MAPLEWOOD, N. J.

Brinley and Holbrook, New York City, Landscape Architects



THE SERVICE ENTRANCE

THE PLAYGROUND



Nichols, Nason and Cornell, Minneapolis, Landscape Architects

THE CHISHOLM HIGH SCHOOL, CHISHOLM, MINN.

landscape lawn areas, which develop the respect of the student, are contrasted with an informal playground area for the children, who play freely without having to destroy the beauty of their school grounds.

The view of the main entrance of the Tenafly High School grounds, Marjorie Sewell Cautley, landscape architect, shows a delightful grouping of evergreen planting on either side of the approach to the main entrance, which not only softens the constructional lines and gives to them a definite relationship to the natural surroundings, but also provides an effect in winter time that is always pleasing, during the season when the approach to buildings is apt to be most uninteresting because of the lack of color.

From Cold Northern Minnesota

From the Middle West there are two pictures of a luxurious planting development at Chisholm, in cold northern Minnesota. In spite of the rigors of this northern climate, broad, well-maintained lawns are provided, and ample groups of healthy, thriving shrubs are shown. Chisholm is a rather drab mining community. The effect of landscape work on the school in this town will undoubtedly have a lasting esthetic influence on the students, in addition to the value of the school and its surroundings as a central area of beauty in the town itself. Other portions of the ground provide ample recreation space, so that there is no robbing of the child's rights to play in order to produce beautiful grounds, but, rather, these functions are properly separated and placed in their proper locations.

ANOTHER VIEW OF THE CHISHOLM HIGH SCHOOL GROUNDS

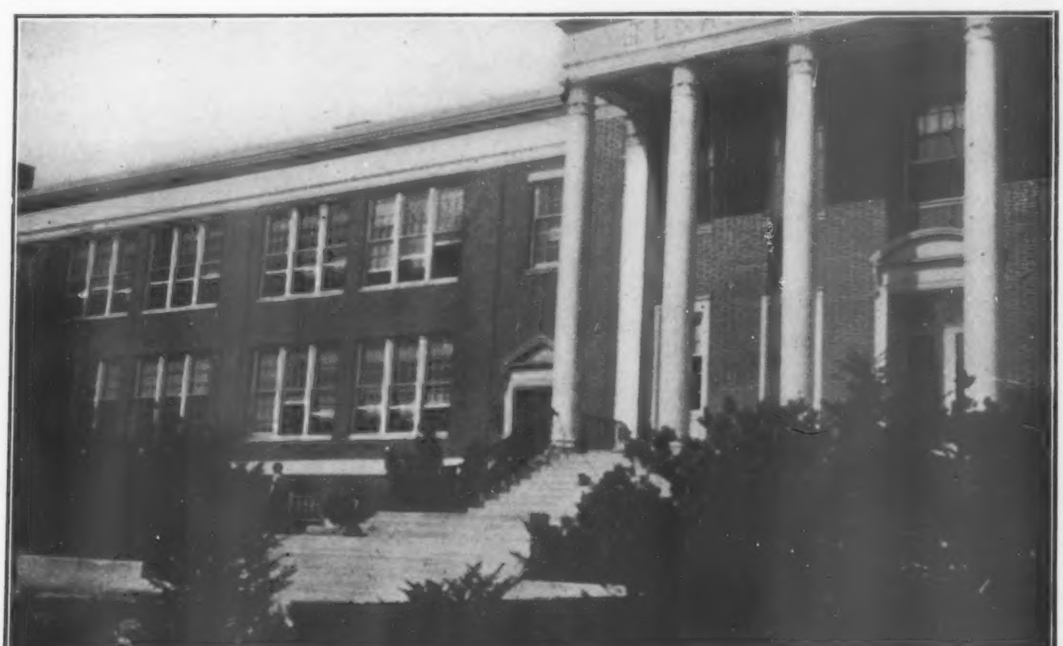
John William Gregg, Berkeley, Landscape Architect

AGRICULTURAL GROUP, UNIVERSITY OF CALIFORNIA CAMPUS, BERKELEY, CALIF.

From Oakland and Berkeley

From the Far West we have a uniquely beautiful garden development in Mills College, Oakland, Calif., of which Howard Gilkey is the landscape architect. This is a gem of a garden feature which would be at home on a highly developed and expensive estate. There is no reason, however, why this is not appropriate on school grounds, as its cultural qualities are excellent. This pool, with its surroundings, has taken advantage of natural scenery as well as artificial development.

The college view from the University of California campus, of which John William Gregg is



Marjorie Sewell Cautley, Ridgewood, N. J., Landscape Architect

MAIN ENTRANCE, TENAFLY HIGH SCHOOL, TENAFLY, N. J.

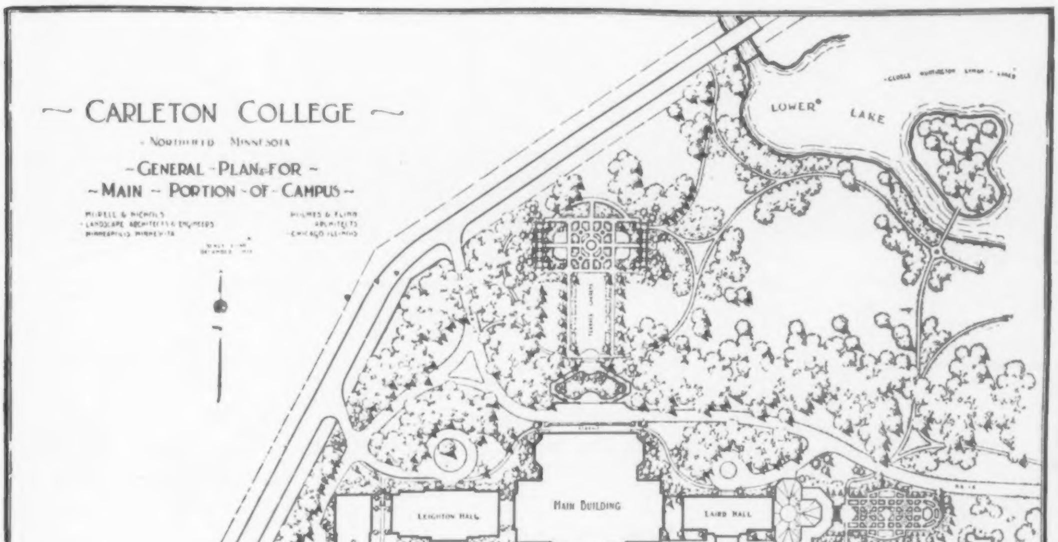
Howard Gilkey, Oakland, Landscape Architect

GROUNDS ADJACENT TO ETHEL MOORE HALL, MILLS COLLEGE, OAKLAND, CALIF.

the landscape architect, has also taken advantage of natural opportunities. The landscape architect is continually seeking the best use of the things that exist in a picture originally. Much of his effort is put forth to make buildings and their surroundings look as though he never had worked on them and that the scenery just happened to be beautiful in itself. This is distinctly true in the informal park type of work. The picture is fascinating in that the building seems to have dropped into a lovely setting of massive forests and distant hills with broad, open lawns on which apparently no work has been done, and yet the effect is subtly attractive. In this case, the broad, flat lawn has been used for the active recreation of football as well as for the mental recreation of adding to the attractiveness of the picture.

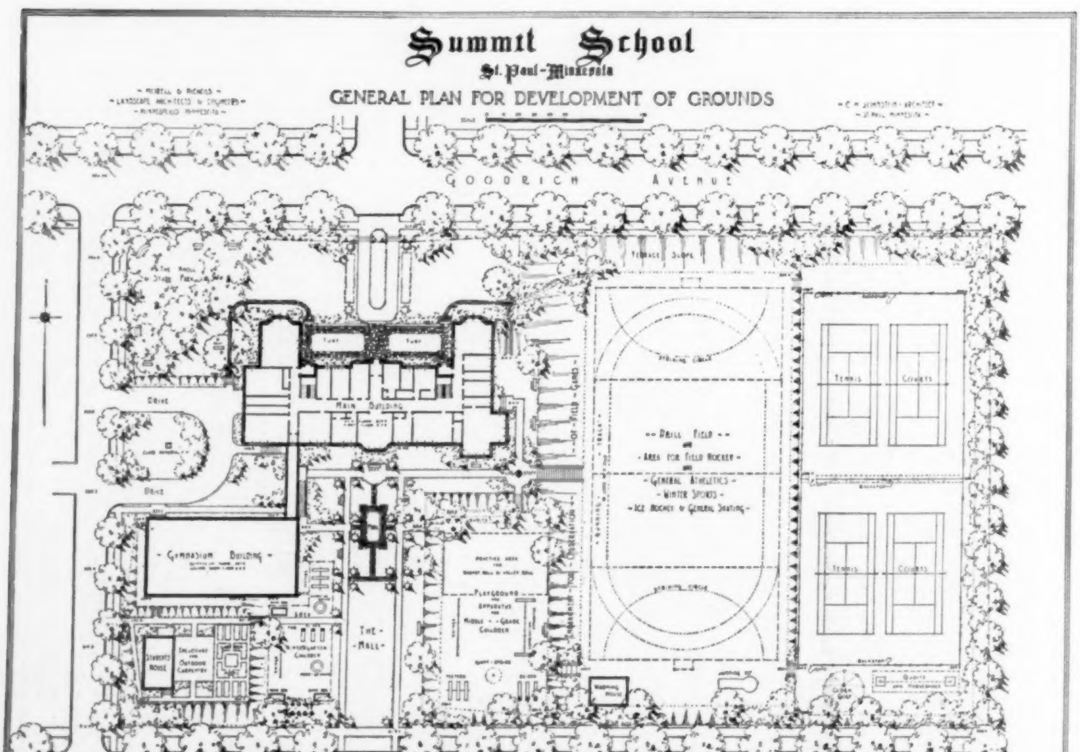
From Minnesota Again

The view of Carleton College, a progressive, Middle Western institution, the work on which was carried out by Nichols, Nason & Cornell, landscape architects, of Minneapolis and St. Paul, is another example of the adaptation of natural scenery to a college setting. This picture, despite its natural appearance, is decidedly artificial in development. Originally, a small stream flowed



Morrell and Nichols, Minneapolis, Landscape Architects

LYMAN MEMORIAL LAKES, CARLETON COLLEGE, NORTHFIELD, MINN.



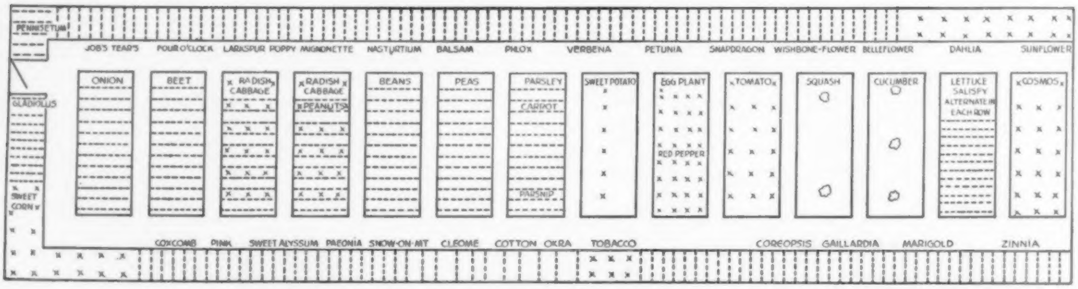
through this valley. The land was low, swampy, full of rank vegetation typical of swamps, and presented a most uninteresting appearance as well as harboring unsanitary conditions. The idea was conceived of dredging and damming the stream. In this way a series of three attractive lakes were built, which have added greatly to the park area of Carleton College. The lakes are used for quiet, restful recreation in the summer, and in the winter are the center of skating and other activities. Most of the pageants of the college relate to these lakes. In the background of the picture is one of the buildings of Carleton College. The relationship of one of the lakes to the definite formality of the building group itself is indicated on the plan of the main portion of the campus. The distinct break from the well-synchronized groupings of the buildings along formal lines, to the lovely informality of the lake area, makes these college grounds decidedly attractive and restful. Ample space is provided in other portions of the grounds for athletics and sports. This park area adds to the amenities of college life from a different aspect from that which many colleges are able to furnish.

Summit School, in St. Paul, is an illustration of a concise plan of school grounds of highly diversified character. The landscape architects, Morell and Nichols, of Minneapolis, had a problem of planning, on a limited area of land, recreational activities of many kinds, yet endeavored to have an environment of beauty for the most attractive school building. The front of the school is park-like in treatment; on the sides are provisions for field hockey, tennis courts, and other sports appealing to a certain age of girls. Also included are playgrounds for children down to kindergarten age, with garden plots and other features for outdoor recreation. The plan shows the remarkable possibilities that are available when definite thought is given, by the landscape architect, to proper disposition of space requirements, yet harmonizing these with planting and proper decoration of the school property as a whole.

An Encouraging Trend

These examples are only a few of many attractive schools with properly planned surroundings that may now be found throughout the United States. They are most encouraging in that they are showing a trend of appreciation of esthetic values, and in that these can be obtained without any sacrifice of the needs and requirements of recreational activities. Landscape architecture, as practiced in America, is one of the newest of the fine arts, though gardening is one of the oldest of the crafts, for man's first traditional home on this earth was a garden. It is interesting to know that after all these centuries our educational institutions are beginning to realize the proper functions of gardening and of landscape architecture as a part of every building development. Well-planned grounds, green shrub planting, and proper disposition of shade trees, and flowing lawns, make an environment that provides the mind with the greatest relaxation from the rigors of the schoolroom and the athletic field and does much to increase the happiness and culture of the student.

For Directory of Landscape Architects for University and School Projects, see Section XIV of this volume.



THE DUNCAN AVENUE SCHOOL GARDEN, ST. LOUIS

School Gardens

Purpose—Location—Plans—Plants—Seeds—Shrubbery—Borders—Supplies—Planting—Cultivation

BY DAVID A. WARD

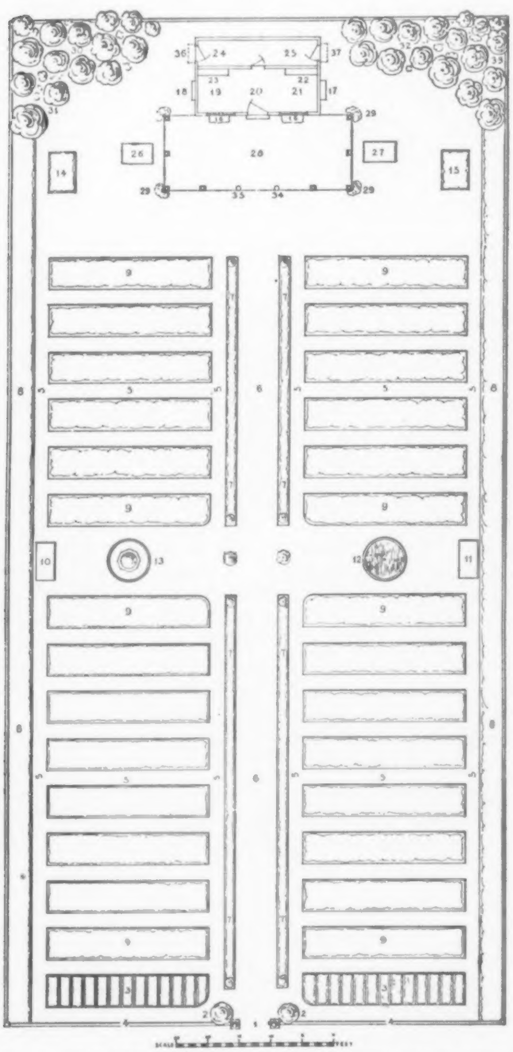
SUPERINTENDENT OF SCHOOLS, CHESTER, PA.; PRESIDENT OF THE SCHOOL GARDEN ASSOCIATION OF AMERICA

SCHOOL gardening may be engaged in as an after-school recreation or as a regular school activity. It is profitable as an educational activity in either case. Its importance, however, justifies its place in the curriculum as a part of the child's education, and it should be given school time.

Nature education is one of the most fruitful

P. S. 177, NEW YORK CITY, AT MARKET AND MONROE STREETS, MANHATTAN
This photograph shows a good layout for a garden

sources of culture and character building. It has three distinct values. Regular and systematic instruction in nature provides the means for discovering special abilities and tendencies in the child that may lead to occupational studies. There is a second value in the development of the appreciation of beauty. From the broad expanse of the landscape to the microscopic examination of the parts of a flower, there is a range of unlimited esthetic possibilities. The emotional element in human life and activity is of such importance, and the appreciation of beauty is so vital to the control of the emotions, that no opportunity for the development of the esthetic side of child life should be overlooked. The third value in nature education is its character-building influence. Nature perpetrates no frauds. The honest application of nature's principles produces satisfactory results in the growth of plants. Any diversion from these principles will show in the defective maturing of the plant. There is a lesson in honesty in every plant cultivated.



PLAN OF MODEL SCHOOL GARDEN, NEW YORK CITY

The school garden is a laboratory for the study of nature. A garden on the school ground has the advantage of being convenient for observation and study. Besides the recreational value, it provides an easy means for studying plant growth without the formal organization of a field trip.

School gardening should be a part of the regular curriculum and should be provided for in the budget of the board of education. The school garden is an all-year project. Lessons in planning and the principles of plant culture can be given through the fall and winter months, and the preparation of the ground and the actual planting and tending of the garden will occupy the spring months. There should be a supervisor of gardens employed on a twelve-months basis, so that the tending of the garden can be continued after the school term and the harvesting of the products can be properly done.

In the planning and management of school gardens, there are certain features which should have careful thought in order that the best results may be secured. The main purpose of the school garden is to provide a working laboratory for nature education. The garden, therefore, should be regarded as a special feature of the nature education department. Its location, plan, the kind of plants, seeds, shrubbery, borders, etc., should be planned with this aim in view.

Location

The location of a school garden, of course, is dependent primarily upon local conditions. There are, however, a few principles which should be observed in selecting a spot for the garden. The garden is distinctly a school exercise; therefore, it should be located on the school lot if at all practicable. In order that there may be as little danger as possible of interfering with play, the garden should be in the rear or at one side of the school grounds. If separate playgrounds are maintained for boys and for girls, the location of the garden should be such that it will be accessible to both groups of children. By all means, a location which is favorably situated as to sunshine is necessary. It is sometimes desirable to inclose the garden plot with a fence; in many instances, however, such a community interest in the garden can be aroused that this precaution will not be necessary.

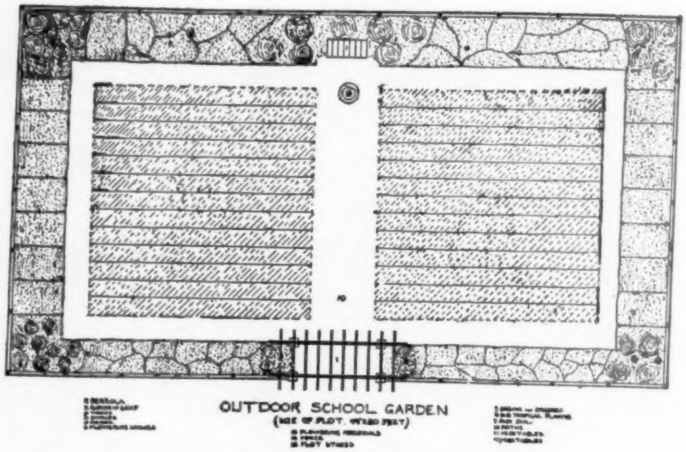
Plans

As in the case of locating the garden, the plan for the garden itself will depend somewhat upon the amount and shape of the ground available for gardening. It is much better if there is ground enough to make a definite plan for a garden, and draw the plan to scale on paper. Then the paper plan should be laid out and actually marked off on the ground where the garden is to be planted. Any plan that will provide passageways between

plots will do; however, there are two or three methods of planning a garden which are regarded by experienced garden directors as meeting the requirements for class instruction in school.

One method provides individual plots usually extending laterally from a central passageway, the plots separated by narrow paths. The individual plots may be of any length, but should be narrow enough for the pupils to cultivate the plants easily from the path.

Another method of planning a garden provides for mass planting of vegetables and flowers. The vegetables are planted on either side of a central path, and flowers are planted around the entire garden as a border.



PLAN OF TYPICAL SCHOOL GARDENS AS NOW BEING DEVELOPED IN SCHOOLS, NEW YORK CITY

Still another method of planning is to lay out a series of vegetable plots of any length and a convenient width for cultivation, separated by paths running lengthwise. Around this entire series of plots is a passageway, and on the outside of the passageway are smaller plots for flowers. This plan is convenient for cultivation and produces a total effect of symmetry and beauty which is very acceptable.

Where there is not room for a formally planned garden, any small space may be used for flowers or vegetables, and the arrangement for planting may be planned to suit the plot available, observing the principle of providing space for the pupils to work from, so that all the plants can be reached from the path.

Plants

The plants best suited for school gardens are annuals. It is better that the children have the experience of planting seeds and observing the growth of plants each year from the seed to maturity. Vegetables or flowers may be used. They may both be combined in the same garden. The ordinary garden vegetables such as radishes, beets, carrots, onions, beans, peas, etc., may be used. In planting flowers it is well to select varieties that will bloom at different periods. This adds interest to the work.

Seeds

Seeds can usually be procured at a local seed store. Many seedsmen supply penny packages of seeds, both vegetables and flowers. Usually the package has printed directions on the outside for planting. These directions should be followed to secure the best results.

Shrubbery

Shrubbery may be used as a background for the garden to give it a beautiful setting. Also the planting and tending of shrubbery in the front yard of the school may be carried on as a garden exercise, even though it may have no connection with the formal school garden. Planting of shrubbery, however, should always be carefully planned.

Borders

Every garden should have a border. Borders of flowers will add to the beauty of a vegetable garden. The border may be a single row of flowers, or a bed several feet in width consisting of different varieties of flowers. A very effective border can be planned by planting several different kinds of flowers in parallel rows.

Supplies

A few simple tools such as hoes, rakes, and a sprinkler are sufficient to cultivate a garden. If the plot is not large enough to be ploughed, then two or three spading forks should be supplied to spade up the ground. These, of course, should be furnished by the board of education; however, if there is no appropriation for gardening, a teacher who is especially interested in promoting the work of gardening, can easily secure such tools as are necessary through the children, who will be willing to bring them from their homes. Fertilizer is often necessary. If there is no fund for this purpose, either natural or commercial fertilizer can often be secured through the generosity of interested persons in the community.

Planting

In early spring, as soon as the ground is dry enough, it should be prepared for planting. If the garden is not large enough to be ploughed, then the ground should be carefully spaded by the use of spading forks. It is harmful to the plants to spade the ground while it is wet. After the


SCHOOL GARDENS, ATLANTA, GA.

ground has been spaded to a depth of eight or ten inches, it should be thoroughly pulverized, and the surface raked carefully. It is then ready to be marked off into plots for planting. The planting should be done as early in the spring as the weather will permit. The seeds should be planted in rows and carefully covered with finely pulverized soil to the proper depth, which is usually stated in the printed directions on the seed package.

All the children should have a part in the preparation of the ground and the planting of the seeds. This, of course, requires some planning and distribution of the work. One group may work while another observes and receives instruction from the teacher.

Cultivation

A garden, to be successful, should be cultivated frequently, beginning as soon as the plants are well above ground. The entire surface of the garden should be stirred with proper garden tools, and all weeds should be destroyed. The weeds growing near the plants should be pulled out by hand, so as not to injure the plants. The cultivating, of course, should be done when the ground is in proper order, that is, when it is not too wet. Watering is usually not necessary in the early spring months. In the late spring and summer it may be necessary to use the sprinkler in cultivating the garden.

I have not attempted to go much into detail in giving instructions for the actual work of gardening. The variations of climate, soil, and other conditions throughout the country are such that instructions can only be generalized. The few suggestions I have made are of general application and are rather a summary of the directions for gardening by leading directors of school gardening in several different parts of the country. The summary is made with such knowledge as I have of gardening.

The effect on the morale of the school is such that it will be profitable to plan and cultivate a school garden even under difficulties, and the greater the difficulties, the more enjoyment will the pupils derive from the success of raising a garden. There is no school activity that is more effective in promoting a spirit of cooperation and improving the cultural tone of the school than the school garden.

AMERICAN FENCE CONSTRUCTION CO.

Guaranty Fifth Avenue Building, New York, N. Y.

SALES OFFICES IN PRINCIPAL EASTERN CITIES

"Afco" Iron Picket Fences—"Afco" Chain Link Wire Fences Playground Equipment—Baseball and Tennis Backstops

"AFCO" School Fences

This company offers a wide and complete choice of designs in standardized fences and gates both of iron picket and chain link wire types. In addition, it is prepared to execute special-design fences and ornamental iron work from architect's designs. Some of our work of this kind is pictured here.

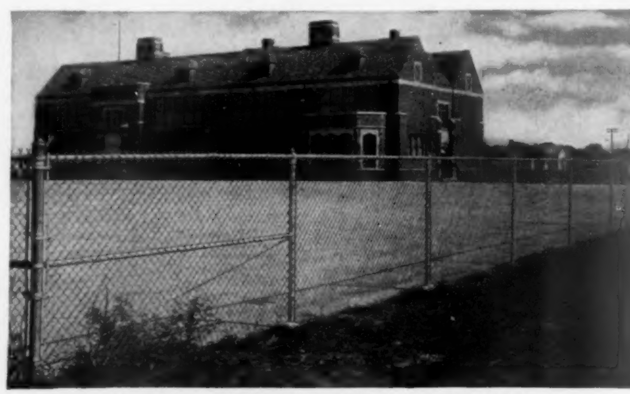
Afco Fences—whether copper-steel Chain Link or dignified Wrought Iron — is a quality product. Even so, there are other things to consider—erection for instance. In our compact, close-knit organization the construction men work with an appreciation of Company responsibility which shows in the fences they build.

Iron Picket Fences

Iron Picket fences, because of the infinite possibilities of ornamental design work, are standardized only in respect to the general use of certain "plain" picket fences. Ornamental work, special gates, etc., are executed in infinite variety.

Chain Link Wire Fences

Chain link wire fences, however, are a standardized product, in heights from 4 to 10 ft., as per specification details presented on the following page. All are built with Afco Chain Link Fabric of rust-resisting copper-bearing steel wire, galvanized after weaving by a special hot dip process.



"AFCO" GUARDIAN FENCE, 5 FEET HIGH
(See Specification)

Catalogues, installation views, and blue prints of stock and semi-standard designs of iron or wire fence are available for reference.

Athletic Fields

Playground and athletic fields, if detached, often require the more positive protection of a barb-wire topped non-climbable fence—for which a specification is given on the next page.

The Company also builds tennis fences, baseball backstops, handball court enclosures of standardized design, the detail specifications of which will be furnished on request.

AN ORNAMENTAL "AFCO" IRON FENCE
Designed by Howard Chamberlain, Architect for Yonkers High School

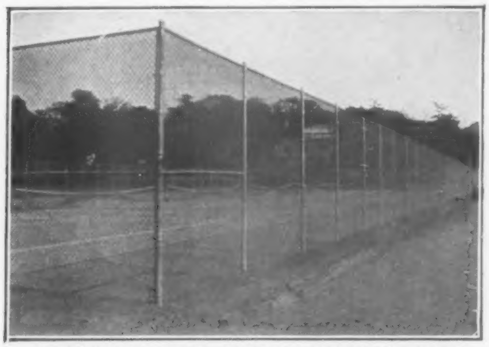
SPECIFICATIONS

AFCO GUARDIAN FENCE (FOR SCHOOL YARDS) [See illustration on facing page]

Heights shall be 4, 5 or 6 ft.

Posts—End, corner and gate posts for gates up to 12-ft. openings shall be 2-inch square tubing (wt. 3.65 lbs. per lineal foot. Line posts shall be 2-inch outside pipe diameter) 2.65 lbs. per lineal foot.

Top Rail—Entire length of the line of fence, with the exception of the gate openings, shall have a reinforcing top rail of 1⅝-in. outside diameter standard wrought pipe, the lengths coupled together with outside sleeve couplings.



A TYPICAL AFCO TENNIS COURT FENCE

Wire Fabric—Shall be one single course of Afco Chain Link, made of standard gauge No. 9 (medium weight) wire, woven in a 2-in. mesh. Top and bottom selvage barbed. Hot dip galvanized after weaving, to give a coating of not less than 1.2 oz. per sq. ft. of actual wire surface. Fastened to the line posts with staples, to the top rail with No. 12 binding wire, to the terminal posts with straps and bands.

Bottom Reinforcing—Shall consist of one course of No. 7 galvanized coiled spring wire, running horizontally along the bottom of the fence, fastened to the fabric at intervals of not less than 2 ft.

Gates—The gates shall be made of 1½-inch square tubing, impregnably joined at corners with arc-welding; equipped with special hinges permitting full swing and attachment for padlock device. The gate frames shall be filled with fabric same as fence.

Framework Finish—All framework parts shall be galvanized by the hot dipping process after fabrication. Bolts used in assembling shall be hot dipped galvanized.

Post Footings—All posts shall be set in concrete bases, those for corner, end and gate posts 15-in. diameter and for the line posts 10-in. diameter, all 3 ft. deep. Mixture shall be 1:3:5 Portland cement, sand and crushed stone or gravel, cast rough in the ground, and domed above grade to shed water.

In General—All materials shall be the very best of their respective kinds, shipped knocked down so as to be easily assembled and erected. (On contracts not including erection, we shall furnish complete plans and setting instructions.)

AFCO BASEBALL BACKSTOP (Details on request)

AFCO BULWARK FENCE (FOR HEAVY DUTY)

This is a heavier weight fence, and is recommended wherever the service requires maximum ruggedness in a fence—and always for heights over 6 feet. The above "Guardian" specification applies with the following exceptions:

Heights shall be 5, 6, 7, 8, 9 or 10 ft.

Posts—End, corner and gate posts with single gates up to 6-ft. or double gates up to 12-ft. opening shall be 2½-inch square tubing (wt. 6.5 lbs. per ft.). Gate posts for larger gates up to 26 ft. double shall be 3-inch square tubing (wt. 9.7 lbs. per ft.) with ornamental post top fittings.

Gates—Made of 2-inch square tubing, arc-welded at the joints with fittings same as gates with heavy fence.

AFCO "1103" NON-CLIMBABLE FENCE

This is a barb-wire topped fence for athletic fields, property lines, etc. The following alternate paragraphs should be employed in specifying:

Heights—7 or 8 ft. overall when erected.

Posts—End, corner and gate posts same as for "Bulwark" fence. Line posts shall be AFCO special "I" beam section with dimensions 2¼-inch by 1¾-inch (galvanized wt. 4.25 lbs. per lineal foot) spaced 10 feet apart. Posts to be furnished with a one-piece pressed steel arm clamped to incline inward at an angle of 45 degrees. Arms to be formed with tongues for attaching barbed wire topping.

Barb Wire—Fence shall have 3 courses of 4-points, thick-set galvanized barb wire, galvanized after weaving, fastened with staples to the post overhang, above the fabric.

Iron Picket Fence

3-in. I-beam line posts (5½ lb. section up to 6 ft. high—7½ lb. for greater heights) set in concrete without back bracing. Center-rib channel rails to afford extra metal where pickets are calked. Strong rigid panels 10-ft. long furnished with adjustable center support.

COLDWELL LAWN MOWER COMPANY

Newburgh, N. Y., U. S. A.

FACTORY BRANCH
188 No. Wacker Drive, Chicago, Ill.

FACTORY BRANCH
119 S.W. 2nd St., Des Moines, Ia.

Since 1867 Coldwell Dependable Lawn Mowers have been contributing in a large measure to the development and maintenance of beautiful Lawns throughout the entire civilized world. Successive improved models have been developed to meet the varying conditions in the different sections of the country; keeping in mind constantly the importance of strict adherence to the original Coldwell policy; to provide at all times a **thoroughly dependable** lawn mower and a size and style suited for every lawn mowing and rolling problem.

ROLLING AND MOWING ON STADIUM AT UNITED STATES MILITARY ACADEMY, WEST POINT, NEW YORK

"L"-TWIN WITH GANG ATTACHMENT, CUTTING 60-INCH SWATH ON GROUNDS OF MT. SAINT MARY'S ACADEMY

The large lawns and athletic fields now so common a sight in connection with public schools, universities and colleges require special thought and care if they are to be kept beautiful and efficient and thus reflect the proper atmosphere of the setting.

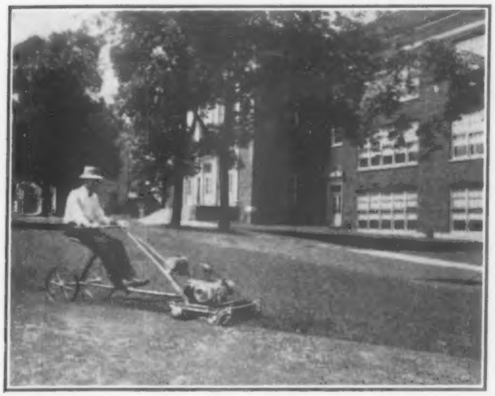
The value of a light rolling with each successive mowing has long since been recognized. It helps to control dandelions and other lawn pests, firms the soil around the tender grass roots, helps to conserve moisture, irons out the surface and produces a fine velvety finish to the turf. The successive rolling of baseball, tennis and other athletic fields is, of course, essential to the development of a smooth playing surface.

EXTREME FLEXIBILITY PERMITS OF CLOSE TRIMMING

The Coldwell Power Lawn Mowers and Rollers are especially well adapted for the use of schools and colleges. Being equipped with **full width drive rollers,** they may be used for **combined rolling and mowing,** or for **separate rolling** only. The principal weight of the machine is carried on the roller which prevents marking and permits of trimming clean along walks and driveways. The use of hand mowers for trimming is practically eliminated.

The brief description of the various models on the opposite page will aid you in the selection of the "Coldwell" best suited for your grounds.

Let us send complete details or arrange with nearest Coldwell distributor to demonstrate.



"TWIN THIRTY" WITH RIDING SULKY ON HIGH SCHOOL GROUNDS

"L" TWIN WITH GANG ATTACHMENT ON DORMITORY GROUNDS AT VASSAR COLLEGE

"Twin Thirty"

Rolls and **mows** simultaneously six to eight acres per day. Has full 30-inch, two-section drive roller with differential between rollers to prevent marking and make turning easy. 30-inch, 5-blade cutter.

Equipped with **two-cylinder,** four-cycle, water-cooled motor which provides an abundance of reserve power, is free from vibration and noise and will develop maximum power continuously in hottest weather without overheating.

Riding sulky for the operator, also grass catcher may be had as extra equipment.

Extremely useful where athletic fields are to be maintained.

"L" Twin

Rolls and **mows** simultaneously four to six acres per day. Full 25-inch, two-section drive roller with differential. 25-inch, 5-blade cutter.

Two-cylinder, four-cycle, water-cooled motor supplies unusual reserve power.

This model may be had with the two 20-inch auxiliary gang units which increases the swath to 60 inches and more than doubles the capacity. Very useful for the wide open stretches of lawn.

In the "L" Twin is combined extreme flexibility for trimming and terrace work; a 25-inch combined mower and roller or separate roller and, with the gang attachment, a mower of exceptionally large capacity.

Riding sulky for the operator, also grass catcher may be had as extra equipment.

"L" Junior

Rolls and **mows** simultaneously four to six acres per day. Full 25-inch, two-section drive roller with differential. 25-inch, 5-blade cutter.

A powerful, single-cylinder, four-cycle, water-cooled motor drives this light-weight mower and roller, furnishing plenty of power for use on grades and in tough grasses. Simple and sturdy in design and construction and moderate in price. Thoroughly dependable and extremely economical in operation.

Grass catcher may be had as extra equipment.

"Cub"

Rolls and **mows** simultaneously three to four acres per day.

Full 21-inch, two-section drive roller with differential. 21-inch, 5-blade cutter.

A light weight, simple, economical and dependable power mower and roller at a very moderate price. Especially well suited for lawns surrounding the smaller schools and also very useful for trimming and cutting the small plots on the larger campuses.

Equipped with a 4-cycle, water-cooled motor having unusual power for the size and weight of the machine. Unexcelled for hilly lawns.

Standard Features in All Coldwell Models

Full-width drive rollers
Four-cycle, water-cooled motors
All machines complete, including the motor, designed and built in the Coldwell factory
Timken tapered roller bearings throughout
Alemite-Zerk force feed lubrication
Oil tempered, self-sharpening blades
Automatic spring loaded clutches require no adjustment
Combined rolling and mowing, or separate rolling when desired
Thoroughly dependable, trouble-free, economical operation over a period of years
A large selection of styles and sizes and at prices assuring the greatest possible value

---

A Complete Dependable Line of Hand, Horse and Power Lawn Mowers

SINCE 1867
COLDWELL
DEPENDABLE LAWN MOWERS
Hand—Horse—Gasoline—Electric

IDEAL POWER LAWN MOWER COMPANY

Main Office and Factory

438 Kalamazoo St., Lansing, Michigan

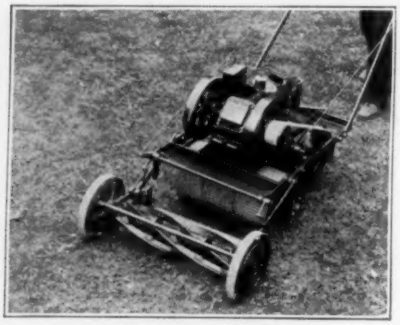
FACTORY BRANCHES

237 Lafayette St., New York — 413 W. Chicago Ave., Chicago
273 Boylston St., Brookline, Mass. — 161 Vester St., Ferndale (Detroit), Mich.

Canadian Address: AIKENHEAD HDW. LTD., 17 Temperance St., Toronto, Ont.

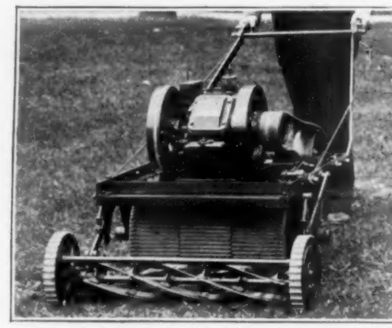
Dealers in Principal Cities

WORLD'S MOST COMPLETE LINE OF GRASS CUTTING EQUIPMENT



IDEAL Twenty-Two

Combination power mower and roller. Width of cut 22 inches. Capacity, 3 to 4 acres per day. Magneto ignition. Five-blade reel. Weight, 430 pounds. Recommended for the average small city, village or consolidated school grounds.



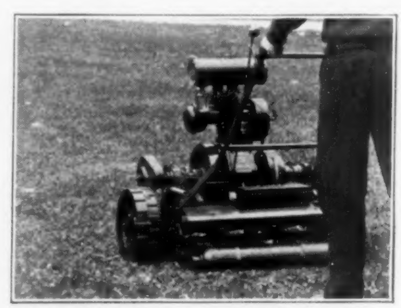
IDEAL Thirty

Roller type. Width of cut 30 inches. Capacity, 5 to 7 acres per day. Magneto ignition. Five-blade reel. Weight, 630 pounds. For large grass areas around schools and colleges. Rolling feature valuable for athletic fields, ball grounds, etc.

IDEAL Twenty

Designed for mowing lawns that are too large to care for conveniently with hand mowers. Also for use on lawn with steep grades.

Width of cut 20 inches. Capacity, 1 to 3 acres per day. Flywheel magneto. Control clutch on mower handle. Speed, 1 to 4 miles per hour. Five-blade reel. Very simple adjustment. Weight, 245 pounds.



IDEAL Twenty-Five

Recommended for mowing lawns that are interspersed with trees, walks, shrubs and where necessary to mow on grades and hillsides.

Width of cut 25 inches. Capacity, 4 to 6 acres per day. Flywheel magneto. Two clutches on mower handles, one for the drive wheels and one for cutting reel. Weight, 350 pounds.

A BIG CAPACITY MOWER FOR LARGE GRASS AREAS

The Ideal Triplex Lawn Mower is the speediest, most economical and most practical big capacity mower in the world.

It is particularly well adapted to the care of average college campus, athletic field, school ground of large acreage, or any large lawn that is landscaped with trees, shrubbery, walks, drives, etc.

Among the prominent educational institutions using the Ideal Triplex are Princeton University, Princeton Athletic Association (two machines), Yeadon School, Haverford College, Connecticut Agricultural College, Massachusetts Agricultural College, Smith College, Connecticut College for Women, Purdue University (two machines), University of Michigan, Evanston Township High School, Ohio State University.

The Triplex has a capacity of from 25 to 30 acres per day. It has the simplest and most responsive control of any big capacity mower built.

Two hand levers and foot throttle control its operation. It can be instantly started, stopped, backed up; and will turn around in its own length and can be manipulated in and out of close quarters and will turn around all obstructions just as quickly and easily as the smallest power mower.

Powered with a four-cylinder, water-cooled, gasoline engine, and equipped with the low-wheeled, close-coupled Bulldog cutting units. Speed from two to seven miles per hour. Total cutting width eighty-four inches.

Special Equipment

When used on a lawn with steep grades or hills the mower can be provided with extra wide traction wheels.

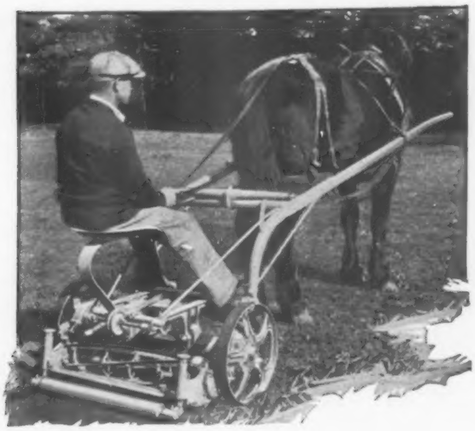
Rubber-tired equipment can be furnished when the mower is to be used on lawns located in various sections that require transporting on pavements or roads.

If you have a difficult mowing problem to contend with, where trees, flower beds, shrubbery, walks, etc., slow up your work, write for our special catalog on the Triplex Lawn Mower.

The Tractor-Pulled Pennsylvania "New" Fairway Mower (Quint or Trio)

The "New" Fairway Mower has fewer parts, by actual count, than any other mower of its type on the market and is by far the quickest and easiest fairway mower to assemble and repair. The operator has constantly been kept in mind on every detail of construction. Any part on the frame or mower unit can quickly be detached for renewal and the adjustments are all of the simplest nature. Simpler construction and lighter weight mean lower operating cost and longer life, as well as fewer and easier adjustments and repairs.

Every moving part of the "New" Fairway is on roller or ball-bearings, except the ground rollers, which are on hardened steel bearings. The Mower Units are interchangeable. The tractor **pulls** the mower and is, therefore, easier to steer and to detach for other work. The lubrication throughout is Alemite.

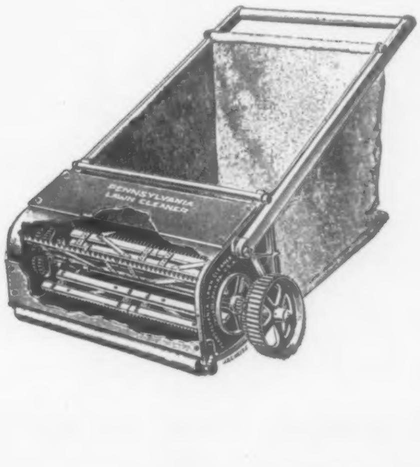


Pennsylvania Fairway Pony Mower

This machine is an outstanding improvement over conventional horse mowers of roller construction. Its lighter construction and larger wheels result in reduced draft; it has greater adjustability for height of cut; only the highest quality roller and ball-bearings are used, and it is equipped with an idling device similar to that used on the large trio and quint mowers.

Pennsylvania Lawn Cleaner and Rake

By means of rapidly revolving rakes, this machine acts like a vacuum cleaner on the lawn, removing cut grass, leaves and other foreign matter that prevents sunlight and dew from reaching the roots. It is also made with brushes for lawn sweeping and for golf putting greens. With this Lawn Cleaner, one boy can do as much and better work than three men with hand rakes.



THE FATE-ROOT-HEATH COMPANY

876 Bell St.
Plymouth, Ohio

THE PEERLESS MOWER SHARPENER

The Peerless Mower Sharpener is a remarkable invention that sharpens all makes of power and hand mowers and cutting units scientifically, quickly, perfectly, doing the work as nothing else can.

One of the big expense items of a well-kept athletic field, campus or golf course is the cost of sharpening mowers and cutting units. Whether you sharpen your own, or have it done outside, you can save money by adopting the modern method—the Peerless Mower Sharpener. It not only **saves money** by sharpening mowers in one-half the time, but does the work **so much better** that there is really no comparison.

If you are using files, it is slow and expensive, as most mowers are now made with hardened blades.

A FEW OF THE HUNDREDS OF USERS OF THE PEERLESS MOWER SHARPENER

Brentwood Country Club....Los Angeles, Calif.
Baltusrol Golf Club ....Baltusrol, N. J.
Barrington School.......Gt. Barrington, Mass.
Columbus Country Club..........Columbus, O.
Cherryhill Club ....Denver, Colo.
Country Club, The ......Salt Lake City, Utah
Colo. State Teachers' College ....Greeley, Colo.
Culver Military Academy..........Culver, Ind.
Great Lakes Naval School.....Great Lakes, Ill.
Galveston Country Club........Galveston, Tex.
Highland Country Club........Pittsburgh, Pa.
Inwood Country Club ....Inwood, N. J.
Inverness Club ....Toledo, Ohio
Kahkwa Club ....Erie, Pa.
Kalamazoo Country Club......Kalamazoo, Mich.
Kenyon College ....Gambier, Ohio
Lansing Country Club..........Lansing, Mich.
Merion Cricket Club ....Philadelphia, Pa.
Nat'l Golf Links of America.Southampton, N. Y.
Naval Training Station..........Newport, R. I.
Northfield Seminary ....Northfield, Mass.
Northwestern University ....Evanston, Ill.
Okla. Agri. & Mech. Col. .....Stillwater, Okla.
Olympia Fields Country Club.....Matteson, Ill.
Pinehurst Country Club ....Pinehurst, N. C.
Piping Rock Golf Club....Locust Valley, N. Y.
Port Arthur Industrial School..Port Arthur, Tex.
Ridgewood Golf Club ....Cleveland, Ohio
Rochester Municipal Corp. ....Rochester, N. Y.
Rutgers College ....New Brunswick, N. J.
School of Mines ....Rapid City, S. D.
Skokie Country Club ....Glencoe, Ill.
Somerset Country Club ....St. Paul, Minn.
Seattle Golf Club ....Seattle, Wash.
Stambaugh Township Schools..Stambaugh, Mich.
Swarthmore College ....Swarthmore, Pa.
Tedesco Country Club ......Swampscott, Mass.
Tome School (The) ....Port Deposit, Md.
Winter Park Golf Club ......Winter Park, Fla.
Westchester-Biltmore Club ....Rye, N. Y.
Youngstown Country Club...Youngstown, Ohio

If you use emery paste you reduce the clearance behind the cutting edge; the mower runs hard and **tears** the grass instead of shearing it.

The Peerless Sharpener produces a perfect cutting edge, with the **proper clearance** or bevel. Mowers run easier, less power is required, hence more speed is obtained. Grass is **sheared** off—not "chewed off" or pulled out by the roots.

Simple to Operate—Equipped with a ⅓-H.P. motor—attach to your light socket. Place the mower in position, make a few simple adjustments, turn on the power, and in a few minutes you have a cutting unit with a razor-like edge. The Peerless Sharpener sharpens all makes of power, horse or hand mowers perfectly. Equipped with special grinding wheel for grass shears, hedge shears, sickles, etc., and an attachment for sharpening all makes of skates, including hockey. Can be used the whole year 'round.

We have a handsomely illustrated catalog awaiting your request. Write today—now—and learn the full possibilities of this wonderful machine.

JACOBSEN MANUFACTURING COMPANY

DEPARTMENT "ASD"

Racine, Wisconsin

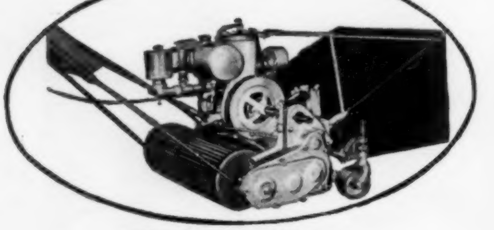
19-Inch "Junior" Mower
For School Lawns 1/4 to 2 Acres

THE JUNIOR MOWER

Will do the work of 2 or 3 men with hand mowers. Has separate reel and traction clutches; fully enclosed transmission with no exposed chains or sprockets to clog with dirt and grass; special reverse gears to sharpen knives under power of motor; specially built powerful motor; will handle heavy grades and terraces. Guaranteed to give trouble-free service for many years.

Estate Roller Mower

Built in two sizes—24″ and 30″ cutting width. For those desiring a roller type mower it represents the ultimate refinement in lawn mower construction. Cut gear transmission enclosed in oil-tight gear housings. Special reverse gears for sharpening cutting unit. Separate reel and traction clutches enclosed in gear housing. Auto-type differential. Powerful Jacobsen Motor. Refined and improved over many years. Low operating and maintenance expense. A sturdy machine that gives a close velvety cut.



THE ESTATE MOWER

Attachments

Sickle bar for cutting dandelions, buckhorn, etc., while mowing lawn.

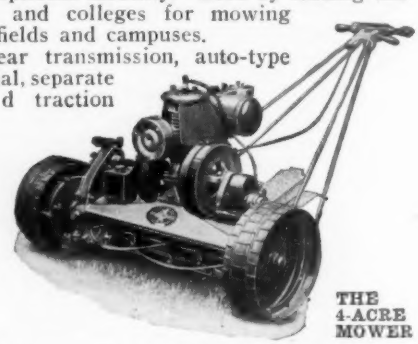
Grass catchers for all models.

Sulky with pneumatic tires increases speed and capacity 50 per cent.

4-Acre Heavy-Duty Mower—24″ Cut

Capacity—4 to 5 acres per day; with sulky 7 to 8 acres per day. A fast general purpose mower with exceptional mobility. Used by leading universities and colleges for mowing athletic fields and campuses.

Cut gear transmission, auto-type differential, separate reel and traction clutches, all enclosed in oil-tight housings. Special reverse gears for sharpening cutting unit. Powerful Jacobsen motor. Entire machine refined and improved over period of ten years. Absolutely guaranteed to be trouble free and of lowest operating and maintenance expense. A popular heavy-duty mower in leading city parks, cemeteries and universities.



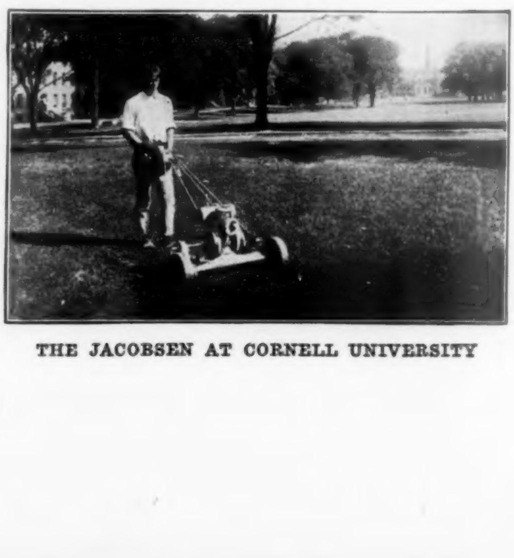
THE 4-ACRE MOWER

RUBBER-TIRED Traction Wheels are now available for this model. Makes a smooth, quiet-running mower, reducing vibration and wear of all parts to a minimum.

Used by Leading Universities

University of Arizona
University of California
Yale University
Northwestern University
Culver Military Academy
Kansas State University
University of Nevada
Cornell University
University of Oregon
University of Wisconsin
Leland Stanford Jr. University
University of Florida (Branch)
University of Idaho (Southern Branch)
University of Chicago
University of Hawaii
Fordham University
University of Minneapolis
University of N. Dakota
University of Utah
University of Wyoming

and many others!



THE JACOBSEN AT CORNELL UNIVERSITY

MODERN MACHINE WORKS, INC.

OFFICE AND PLANT

192–198 Milwaukee St., Dept. A, MILWAUKEE, WIS.

MANUFACTURERS OF THE

Red E POWER LAWN MOWER

The Red E Power Lawn Mower is particularly adapted for large lawns, schools and colleges, institutions, parks, cemeteries, country estates and municipalities.

SPECIFICATIONS

MODEL "A"—20-INCH CUT

Motor—Single cylinder, 1 hp., 4-cycle air-cooled, overhead valve, bore 2¼ in., stroke 2¼ in.

Ignition—High tension. Built-in flywheel magneto

Carburetor—Float feed, with adjustment for all grades of gasoline

Cutting Unit—Heavy-duty reel has five oil-tempered crucible steel blades, double riveted to each spider; 7-in. diameter; self-sharpening

Rear Roller Bearings—Self-adjusting

Drive Wheels — Diameter, 11 in.; width, 2¼ in.

Rollers—Hard maple 3¾-inch diameter. Sectional

Starting—Hand starter.

Handle—Cushioned to absorb vibration

Finish — Durable aluminum bronze, with blue trimmings

Fuel Capacity — ½-gallon gasoline tank—6-hour supply

Cutting Capacity—Two and one-half to three acres per day

Weight—190 pounds

Grass Catcher—Furnished extra. Hooks for attaching are on mower

Quiet—because it has no noisy gears. Safe—because it is always under operator's instant control. Trouble-proof—a high reel clearance permits cutting tall grass without clogging. Safety disc clutch protects reel when sticks, stones or other foreign matter are picked up. Cushioned handle adds to operator's comfort. Economical — requiring minimum fuel and low maintenance cost.

MODEL "A"
(20-Inch Cut)

The Red E is a masterpiece of engineering construction — built to make mowing a real pleasure. The simplest power lawn mower on the market with fewer working parts, giving low operating cost and many years of constant service.

MODEL "B"
(28-Inch Cut)

SPECIFICATIONS

MODEL "B"—28-Inch Cut

Motor—Single cylinder, 2 hp., 4-cycle, air-cooled, overhead valve, bore 2¾ in., stroke 3¼ in.

Ignition—High tension—Built-in flywheel magneto

Carburetor—Float feed with adjustment for all grades of gasoline

Cutting Unit—Heavy duty reel has five oil-tempered crucible steel blades, double riveted to each spider; 7-in. diameter; self-sharpening

Reel Roller Bearings—Self-adjusting

Rollers—Hard maple 3¾-in diameter. Sectional

Starting—Crank or rope starter

Handle—Cushioned to absorb vibration

Finish — Durable aluminum bronze, with blue trimmings

Fuel Capacity—1-gallon gasoline tank—6-hour supply

Weight—300 pounds

Cutting Capacity—Five to six acres per day

THE MOTO-MOWER COMPANY

MAIN OFFICE AND FACTORY

3246 East Woodbridge Street

Detroit, Michigan

BRANCHES OF THE MOTO - MOWER COMPANY ARE MAINTAINED IN PRINCIPAL CITIES

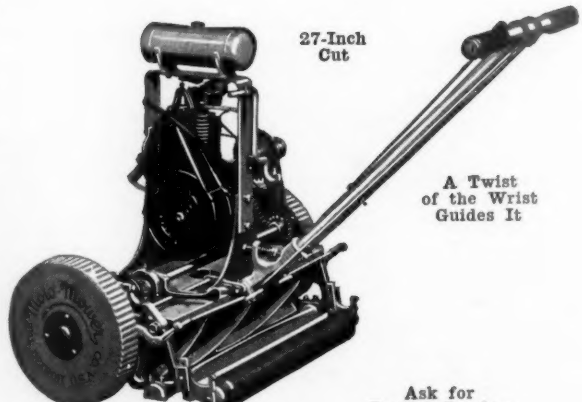
Moto-Mower

TRADE MARK

MOTO - MOWERS ARE MADE IN OTHER SIZES TO SUIT THE USER'S NEEDS

The Detroit Model Moto-Mower

Moto-Mower engineers have developed the Detroit Model Moto-Mower to where it is fully dependable in service, durable, economical, free from mechanical trouble, simple in operation and easy to handle. A new feature is the cutting reel clutch, which is most positive in operation, yet releases the reel by a touch on a foot lever. The traction and cutting units are operated by separate clutches. A drop-out reel device permits removal of the entire reel for sharpening. Through handle grip controls the Detroit Model may be turned to right or left **on its own power.** Throttle control is within easy reach. An in-built flywheel magneto, fully water-proofed, with automatic spark advance are further desirable features. Other details in specifications below.



27-Inch Cut

A Twist of the Wrist Guides It

Ask for Special Catalog

Moto-Mower Weed Clipper

SICKLE-BAR FOR THE DETROIT MODEL

The Detroit Model may be had with a sickle-bar (shown at left) for clipping dandelions, plantain, buckhorn and other destroyers of lawn beauty which cannot be cut by the revolving blades of any lawn mower. This clipper can be attached or detached in a few minutes by removing one nut from the tie rod. Simple in construction, light in weight.

GENERAL SPECIFICATIONS

Width of cut, 27 inches
Cutting adjustment, 5/16 inch to 3½ inches
Cutting speed, ½ to 3½ miles per hour
Cutting capacity, 4 to 5 acres per day
Climbs, 35 per cent grade
Gasoline consumption per day, about 1 gallon
Weight (net), 210 pounds
Weight (crated for shipment), 350 pounds
Color, gray enamel

MOTOR

Four-cycle, valve-in-head, air-cooled
Bore, 2½ inches
Stroke, 2½ inches
Horsepower, 1½
Speed, 600 to 2,000 revolutions per minute
Parts to lubricate, 1 place
Control, throttle
Ignition, magneto
Carburetor, Tillotson

MOWER

Blades, revolving, 5 crucible steel (tempered)
Blade, bottom, turned up edge (tempered)
Clutches, dry disc type
Control, wheels can be engaged either together or separately
Reel bearings, Timken roller, self-adjusting
Handle, tubular steel
Side frames, malleable iron
Chains, diamond roller
Drive wheels, indestructible steel, 14-inch diameter

Section V

BUILDINGS AND EQUIPMENT FOR PHYSICAL EDUCATION AND PLAY

Planning the School Plant in Relation to the Recreational Needs of the Community

BY GEORGE DRAYTON STRAYER

PROFESSOR OF EDUCATION, TEACHERS COLLEGE, COLUMBIA UNIVERSITY

IF THE people of the United States were to spend a billion dollars for new schoolhouses during the next year, there would still be large numbers of children poorly housed, and the need for large investments to replace outworn structures for a number of years. We have been trying, in the United States in recent years, to build enough new schoolhouses to take care of our increased population. We have done relatively little in abandoning old and inadequate buildings. There is evidence that we are about to attack the problem of providing school buildings in a more scientific fashion.

Surveys of city and rural areas, indicating the needs for school buildings over a period of years, have been made in many parts of the country. Schoolhouse planning, which involves the school specialist as well as the architect, has been acknowledged by boards of education as an essential element in good educational planning. One of the most important contributions made by those conversant with the educational program has been in the planning of school buildings to take care of the community's recreational needs as well as of the regular school program.

Community Recreation Essential

The modern program of education includes recreation as an essential element. We no longer build schoolhouses consisting of a group of recitation rooms. In the modern consolidated rural school or in the city elementary school we are quite as much concerned with the gymnasium and auditorium, with the shops and library, with the laboratories and music rooms, as we are with the traditional classroom facilities. There is need, in the development of the modern school plant, to take account of the use to be made of the building by the community after school hours and during vacation periods. No modification is demanded that will make school facilities less available during the regular school session, but a building may prove acceptable to the school and be difficult of use by the community unless the recreational needs of the larger group are considered when the building is planned.

The Most Advantageous Location

School buildings should be placed so as to serve the community. In order to provide the best sort of educational opportunity, they should be relatively large. It is poor economy to build a 12- to 16-room building if the density of population to be provided for will permit of a 24- to 32-room building without requiring elementary school children to walk more than one-half mile. All good planning involves a careful survey of the student population and a consideration of the direction in which population is moving. When this is done, the building becomes equally available for the children who attend and for the group who should use it as a recreational center.

In the case of buildings constructed for junior and senior high schools, we may reasonably expect a greater variety of spaces to be included within the buildings and somewhat more elaborate equipment to be installed. In this case, as with the elementary school, the building should be located with reference to the population which it is to serve. Junior high school students can very well walk from one and one-half to two miles to school. Senior high school buildings should be placed in the general regions that are to be served, and never in the center of the city.

One of the greatest mistakes that have been made in some American cities has been the consolidation of the high school population near the business center of the city. The net result of this faulty planning is to have children coming into school with the heaviest possible traffic in the morning and leaving school in the afternoon with the heavy traffic out from the center of the city. Where junior and senior high schools are planned on a regional basis, the attempt should be made to keep them as far as possible out of the congested areas. This will be further advantageous, not simply from the standpoint of the traffic load already mentioned, but also from the point of view of securing adequate sites.

Large Playground Areas

Recreation for children in school and for the community demands open space. There is no better multiple utilization of city property than that which is made possible by providing large playgrounds in connection with school buildings. Every elementary school of any considerable size should have a playground area of at least five acres. Every junior high school should have a minimum of ten acres, and for senior high schools a minimum of twenty acres of land should be provided. Sites of this size will make possible the installation of adequate playground equipment and development of the best type of play program for the children in the school, and will be equally available for after-school use by children and for the youth and adult of the community.

It is worth while to note the fact that sites as large as or larger than these are already being acquired in cities throughout the United States. In Winston-Salem, N. C., the smallest school site is that surrounding a colored elementary school. It includes five acres. The high school site in this city has 85 acres. In Greensboro, N. C., there is an elementary school site of 13 acres near the center of the city. There are two junior high school sites of 40 acres each, a site for a colored high school of 40 acres, and a site for the senior high school of 100 acres. In the city of Baltimore, Md., one of the boys' high schools has a 35-acre site, and there is a 39-acre site for one of the girls' high schools. Other sites of from five to 20 acres have been made available during the past ten years.

In South Bend, Ind., a small municipal golf course was taken as the site for the junior high school. In White Plains, N. Y., a site of 20 acres was secured for a high school. Tampa, Fla., has school sites ranging from five to 20 acres; and Atlanta, Ga., has a boys' high school site of 20 acres and generous sites for elementary schools for both white and colored children. New York City has built one of its recent schools in a park area that provides most adequate playground facilities. And so one might travel from east to west and from north to south throughout the United States and find communities that have made this investment and are satisfied with nothing less than this adequate program.

Even where members of the board of education are not yet convinced that they can afford to provide playgrounds in connection with school buildings, it will usually be found possible to secure such sites and to finance such a program after a careful survey of the situation has been made. Of course, there will be some buildings necessary in congested areas where the cost of land now occupied by buildings may be thought prohibitive. In these cases it will be necessary to provide unusual facilities by way of gymnasiums in the building and roof playgrounds in order to partially make up for the deficiency of the size of the site.

After the site has been located, the planning of the building becomes a matter of first-rate importance. Even though one respects and admires the work of American architects, he may at the same time recognize the need which they have for extended consultation with specialists who are acquainted with the educational and recreational programs which should be provided both for school children and for adults. It not infrequently happens that buildings are constructed in which major mistakes in the location of the units and in their planning have been made.

Where to Put the Gymnasium

To those of us who work in schools it is a commonplace that the two long sides of a gymnasium should be exposed to the light and air. We want the sweep of air and sunlight across the floor. Nevertheless, many buildings have been constructed with one of the long sides of the gymnasium up against some other part of the building. An even less desirable form of gymnasium has been planned as an extension of the stage of the auditorium. This results in a poor gymnasium and in the refusal of the use of the gymnasium when the auditorium is wanted, or an auditorium which is useful only for spectators when the gymnasium is in use. We have had buildings planned in which the gymnasium has been sunk in a hole in the ground. This sort of facility is not good for children and is of course no more available for community use.

From the standpoint both of the school and of the recreation program for the community, the gymnasium should be built at the end of a wing or in some other manner in a semi-detached position with respect to the rest of the building. Entrances to the gymnasium and to shower and locker facilities should be available for the public when the school is not in session. It should be possible, by locking one or two doors, to completely isolate the school use of the gymnasium from that required by the public.

In our larger schools, whether elementary, junior high school or senior high school, two gymnasiums should be provided. More generous floor space and less provision for spectators is indicated as desirable by those who hope to see both children and adults get some real value out of the recreational program carried on in the gymnasium. Nothing has been more foolish than the planning of basketball arenas in which a group of from ten to twenty boys are given highly specialized training and in which they are exploited for the entertainment of adults who might better be engaged in some worth-while recreational program.

In addition to gymnasiums built as a part of the schoolhouse, it will be found advisable to build play shelters. These structures, consisting primarily of a floor and a roof with sides that can be protected from the weather by heavy canvas curtains, offer unusually good facilities for the right kind of physical exercise. Indeed, the health of the whole population would be improved if those who played either during school hours or

out of school time used play shelters more and overheated gymnasiums less.

As has already been indicated, in the congested areas the roof of the schoolhouse should be used to provide play space. It is important to build a good ship's deck so as to give comfortable play space which can be well drained. It is important, as well, to protect the floor by a second roof, and the sides of the play courts with parapets, wire grating, and, for stormy weather, heavy curtains which will shut out the wind and rain.

Swimming Pools

In a number of school buildings, swimming pools have been provided. This type of facility, if proper purifying apparatus has been installed and if the construction is such as to permit sweeping off the top of the water, will add greatly to the recreational facilities of both the school and the community. As is the case with the gymnasium, access should be provided for the public to showers, locker rooms and to the pool, separate from that provided for school use. This, too, is a matter of planning which is not difficult if one has in mind the multiple use of this particular part of the building.

Dramatic and Musical Facilities

For many members of the community and for children in the school, there are other elements in the recreational program quite as significant as those made available on the playground, in the gymnasium or in the swimming pool. We are building, in all of our modern schoolhouses,—elementary, junior high and senior high,—auditoriums which are planned to give opportunity for the presentation of the work of those interested in drama and music.

In the elementary school the auditorium should be small. It will, however, be available for club groups after school hours. Even in a small auditorium, provision should be made for moving pictures and sound pictures. In this small auditorium the stage is not so important as it is in the buildings accommodating the older children, but even here a comfortable stage should be provided.

In junior and senior high schools we may reasonably plan for an auditorium to seat from one to two thousand people. This will mean that the whole or a considerable part of the school may be assembled from time to time and that the community will find here a real chance for recreation. One of the most important factors in planning the junior-senior high school auditorium has to do with the stage. It is of primary importance that the stage be made large enough to accommodate amateur plays. In our better high schools we are planning stages from 30 to 35 feet deep from the proscenium arch. A good stage needs to be built with a gridiron overhead so that the handling of scenery can be expedited. It is equally essential that modern stage lighting be installed. With such stage equipment, it becomes possible for school children to present, with a minimum of difficulty, the plays they enjoy and which mean so important an outlet by way of worth-while recreation. In the evenings such a stage becomes available for the dramatic club in the neighborhood.

One does not need any longer to propose that an auditorium should be on the ground floor, but possibly it is worth while to indicate that, by placing gates across the corridor, the auditorium may be used outside of school hours without involving the use of other parts of the building. Every auditorium should be equipped with a relatively large moving-picture booth from which moving pictures and sound pictures can be presented. It is assumed, of course, that when the building is constructed, the necessary wiring will be put in not only for the sound pictures but also for radio reproduction in the auditorium and throughout the building. Large dressing-rooms for boys and girls and for men and women can be provided with little additional expenses. In some cases it will be found possible to use classrooms across a corridor back of the stage when unusually large numbers of children or adults are to be placed upon the stage.

The auditorium has another use in providing a stage for the musical productions of the school. A modern junior or senior high school will develop one or more bands, one or more orchestras, and one or more glee clubs. These children need the large assembly space for the presentation of their music to the school and to the public. In any community in which music has been well taught, we should expect the organization of various groups of older people who will use the auditorium for their concerts and for whom other provision will need to be made for practice.

In a modern school building special rooms are provided for band, orchestra and glee club practice. It is not possible, nor is it desirable, to hold all practice sessions in the auditorium. It is easy to plan, in the construction of the building, spaces that will accommodate a band or an orchestra of from 40 to 60 pieces. It is of course necessary to provide somewhat unusual storage room for instruments. These rooms become available for the public out of school hours.

Library and Reading-Rooms

The center of a modern junior or senior high school is to be found in the library and reading-rooms. If the public is to use the school library, this facility should be provided on the ground floor, and a separate library entrance is desirable. Surely we may expect our school libraries to increase in size and importance. If excellent collections of books and periodicals are housed in the school building, it ought to be possible for many adults living in the neighborhood to use these facilities out of school hours. We may reasonably expect that coöperation between the public library and the public school system will continue to be developed.

Community Use of the School Building

But recreation is not a matter of physical exercise, dramatics and music, and reading alone. It may well be proposed that there be no facility available in junior or senior high schools that will not arouse interest and provide opportunity for certain members of the community no longer regularly enrolled in the school. Our modern buildings present unusual facilities in the rooms devoted to drawing, to science, to home economics and to the industrial arts. With some additional storage space provided in order to take care of materials and completed work of the adult group, all these laboratories and shops become available for the community's recreational program.

In most of our communities only one-sixth to one-fifth of the population are regularly enrolled in school. The other five-sixths can continue to learn. If leadership is provided, increasing numbers of young men and young women beyond school age and of older men and women will want to come into the school building in order to continue their education. There is nothing that may more significantly be called recreation than some line of study which expands an adult's horizon and which may stimulate him to undertake creative activity.

Special Features of the Gymnasium and Locker and Dressing-Room Facilities of a New School of Education Building

BY JAY B. NASH

PROFESSOR OF PHYSICAL EDUCATION AND HEALTH, NEW YORK UNIVERSITY

A NEW building recently erected by New York University, for the housing of a number of specialized teacher-training departments of the School of Education, contains a very complete layout of gymnasiums, special exercise rooms, dressing and locker facilities, together with physiological laboratories and offices (Fig. 1). The Department of Physical Education is housed on the second, third, third mezzanine, fourth, fifth, fifth mezzanine, and sixth floors of the building. There are two gymnasiums of identical size on the third and fifth floors, the dimensions of the gymnasium floors being 61 feet by 94 feet.

In connection with the gymnasiums there are one or two particular features to note.

Adjustable Apparatus Feature

In the ceiling of the gymnasium there are located on all cross beams 2-inch flange sockets. These are 4 feet apart, with no flange nearer the side wall than a foot and a half. These flanges are located in rows across the gymnasium, the rows being a minimum of 15 feet and a maximum of 20 feet apart (Fig. 2), with a total of approximately 90 flanges in the ceiling. This feature makes possible any combination of apparatus which it may seem advisable to erect in the future. The location of apparatus can be changed and new apparatus installed without the necessity of any new construction.

Apparatus Room and Offices

In the lower left-hand corner (Fig. 4) is a large room in which all the apparatus can be placed when the gymnasium is being used for other purposes. At the time of University registration this room can be used as a cashier's cage, and at times of social affairs for a caterer's kitchen.

In the lower right-hand corner, offices are located so that they overlook the gymnasium.

Floor—Walls—Window Shades

A large canvas is provided to protect the floor at times of special functions. Tennis and volleyball standards are supported by braces which fit into the sockets in the floor.

The walls are kept clear for use in handball, tennis serve, and other activities. All radiators, clocks, etc., are recessed.

All the long windows are provided with black shades set in metal grooves, so that the gymnasium can be used for projecting moving-pictures and lantern slides.

Locker and Dressing-Room Facilities

A particular feature is to be noticed in connection with the locker and dressing-room facilities, which accommodate on each floor 1,004 regular users of the gymnasium. The basket-locker system has proved to be a great saver of space. In the center of the building (Fig. 3) will be noted the shelves for the deposit of the baskets.

Two types of basket systems have been used extensively in the past. Under one system, the baskets are given out by an attendant and thus can be inspected after each time the material is used. In the other system, the baskets are placed along the wall so that students can procure their own baskets; this is known as the "self-service" plan. The principal objection to the first system is that there is always a congestion when baskets

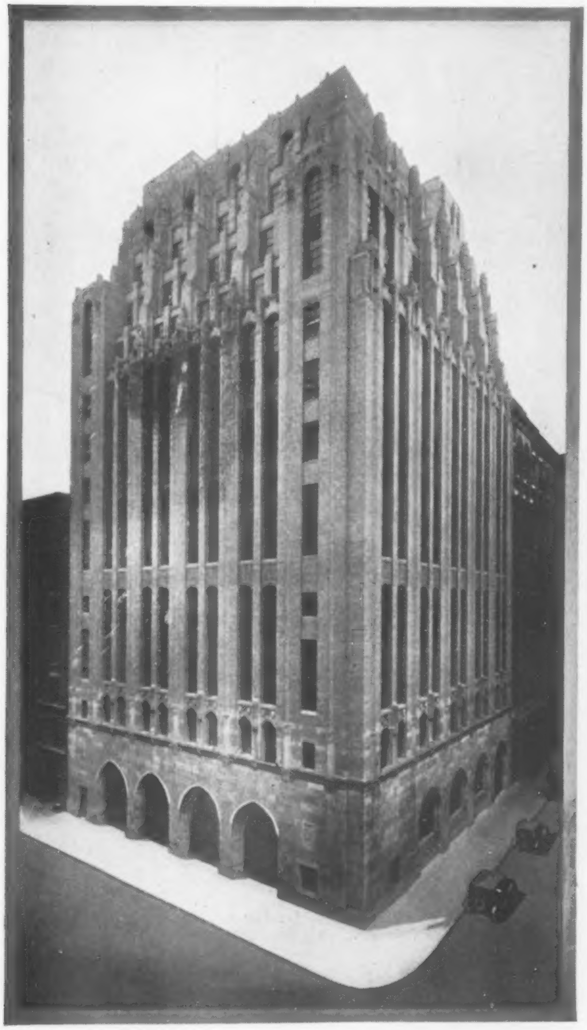


FIG. 1. NEW SCHOOL OF EDUCATION BUILDING, NEW YORK UNIVERSITY
The Department of Physical Education occupies the first seven floors, counting the mezzanines overlooking the gymnasiums. The roof is equipped for a playground

are handed out. One attendant cannot give out baskets fast enough to avoid this congestion. Under the second system, while there is no congestion, as each student gets his own basket, there is no method by which those in charge of the gymnasium may inspect the contents of the baskets and replenish them with clean towels and suits.

The system in use in this gymnasium combines these two elements—self-service and inspection by caretakers. The student takes the basket from the outside where he unlocks his basket compartment with his own lock (Fig. 5); thus the lock problem is solved. All the basket compartments are open to the attendant from the inside, which makes it possible to serve all the baskets and inspect the clothing (Fig. 6). The hollow rectangle around which the basket-frames are constructed is available only to the caretaker. This caretaker distributes clean towels and suits, collects soiled towels, gives out locks if wanted, and has general supervision of the entire floor.

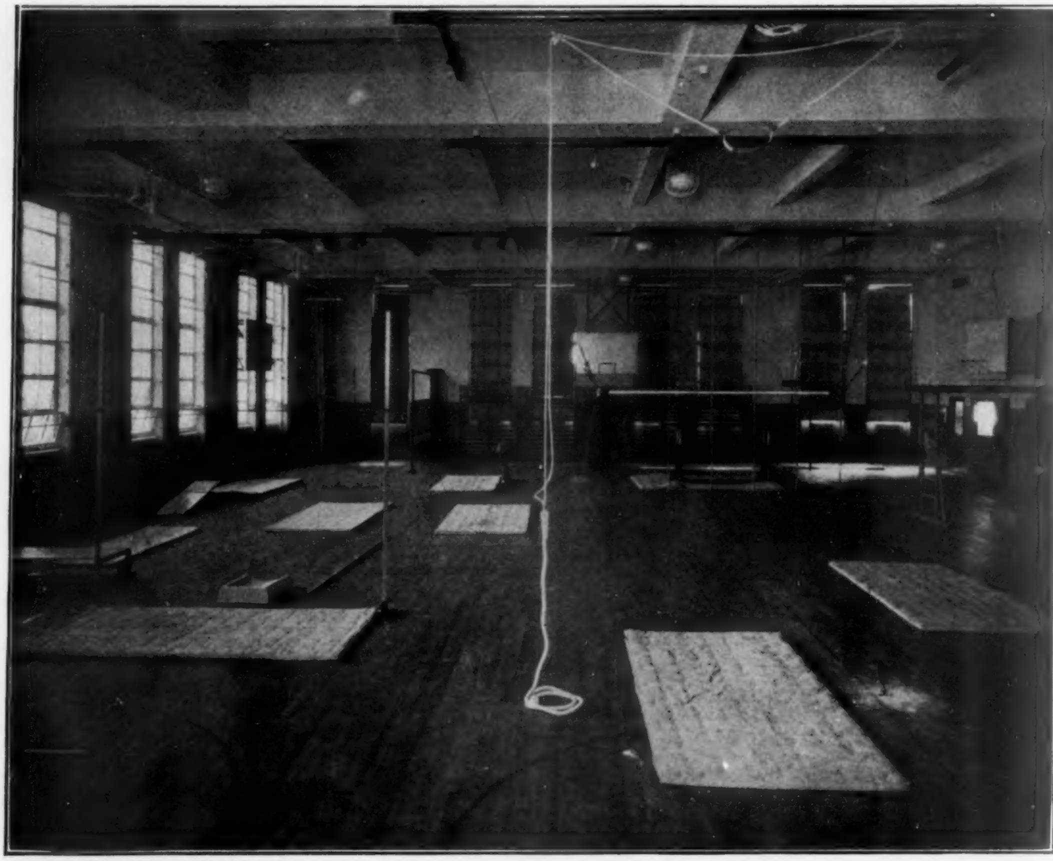
In the girls' locker-room this space-saving plan provides not only for 58 showers with accompanying 116 dressing-rooms, but also a dancing-studio 28 feet by 40 feet, a social room 14 feet by 28 feet, and a rest room 10 feet by 28 feet. On the boys' floor the space-saving plan provided room to double the capacity of the floor, namely, to provide for over 2,000 users and at the same time to save a sufficient amount of space for a social room and three special exercise rooms.

The mezzanine floors in both gymnasiums are utilized for faculty dressing-rooms which are connected to the offices by a spiral staircase (Fig. 4), two rest rooms, two classrooms and two balconies.

The Sixth Floor

The sixth floor is equipped with offices and special laboratories for physiological research. On this floor, in addition to five offices, there are special rooms for corrective gymnastics, five special examination rooms, a laboratory to accommodate 40 graduate students, a workshop, a library, and special laboratory rooms with X-ray, fluoroscopic, metabolism, and photographic equipment. One room is equipped for the keeping of animals which are under observation.

Seven floors in all, with its supporting equipment, constitute a most complete plant for the purpose of training teachers in health and physical education. The building plan is particularly adapted to the needs of an urban university.



Courtesy Narragansett Machine Co.

FIG. 2. BOYS' GYMNASIUM

Note the 2-inch flanges in the ceiling which make it possible to install any type of apparatus. All radiators, clocks, bells, etc., are recessed. Windows are large and equipped with black shades

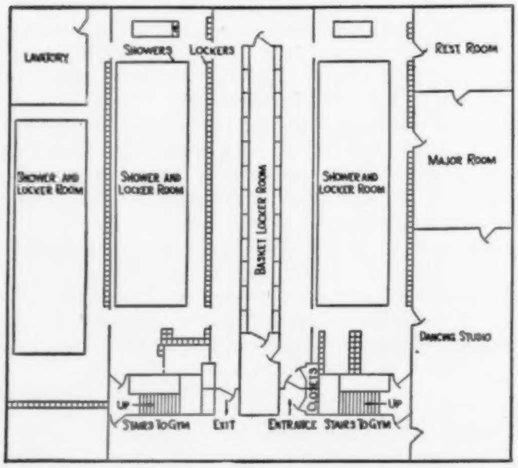


FIG. 3. THE LAYOUT OF THE SECOND FLOOR

Note the space allowed for showers and dressing-rooms for girls, the locker booth in the center, and on the right, dancing studio, major room and rest rooms

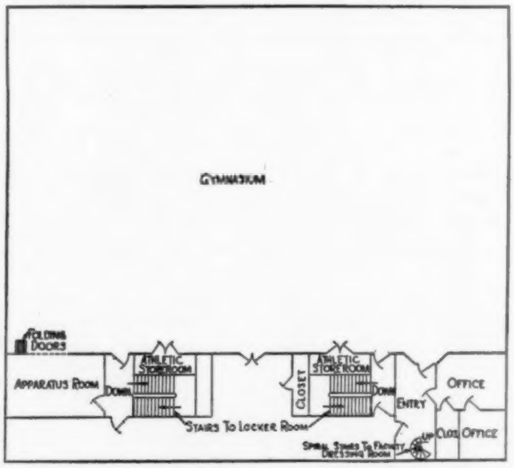


FIG. 4. THE LAYOUT OF THE THIRD AND FIFTH FLOORS

Note apparatus room on left, and convenient offices on right, connected by spiral stairs to faculty dressing-rooms

FIG. 5. THE OUTSIDE OF THE LOCKER BOOTH. NOTE THAT EACH BASKET IS AVAILABLE TO THE STUDENTS ON THE SELF-SERVICE PLAN

FIG. 6. THE INSIDE OF THE LOCKER BOOTH. NOTE THE AVAILABILITY OF BASKETS TO THE CUSTODIAN. CLEAN TOWELS AND SUITS ARE PLACED IN THESE BASKETS BY THE CUSTODIAN. NO STUDENTS ARE ALLOWED WITHIN THIS ENCLOSURE

The Marietta College Field House

BY A. H. SAVENYE

FINANCIAL SECRETARY, MARIETTA COLLEGE

IN planning the Field House completed at Marietta College in the autumn of 1929, certain considerations, common perhaps to many private colleges of liberal arts with not too liberal resources, arose. Among these considerations were the type of building, its flexibility, its relation to our program of physical education, its size, its probable period of usefulness, and finally—but important indeed—its cost of construction and the resultant expense of operation and maintenance.

Originally a standard gymnasium, the counterpart of which may be found on the campuses of many small colleges, was contemplated. Modern tendencies in physical education indicated, however, the need for a type of structure which would offer a wider scope of activities.

Adapting the Plans to a Limited Budget

The usual type of field house, tremendous in size and cost, while admirably suited to the large university where it supplements the standard gymnasium, was not the solution for a small college, but it suggested possibilities for successful adaptation. The money for its construction had to be secured from a relatively poor alumni body. Its size, construction and arrangement must permit its operation and maintenance to conform to, without undue strain thereon, a limited operating budget.

Marietta College is coeducational, one-third of its enrollment being women, but fortunately the Betsey Mills Club, adjoining our campus, gave to Marietta women splendid facilities for physical development. We had only to provide for the men.

Too much credit cannot be given to Frank L. Hayes, Director of Physical Education at Marietta, who, working closely with the Osborn Engineering Company of Cleveland, architects, satisfactorily combined the many advantages of

EXTERIOR REAR OF THE BUILDING

This shows the storeroom that is located at the rear of the building, also the automobile driveway into the Field House and exit doors from the main building

the Field House with the requirements of a gymnasium. Mr. Hayes was for two years on the staff of Fielding Yost of Michigan, and many of the features of the University of Michigan Field House were incorporated on a more moderate scale.

The Marietta Field House is located east of the main campus. The rear of the building overlooks land that may eventually be available for athletic fields. The natural slope of land at the rear of the building would make the construction of adequate seating for spectators relatively inexpensive.

Dimensions

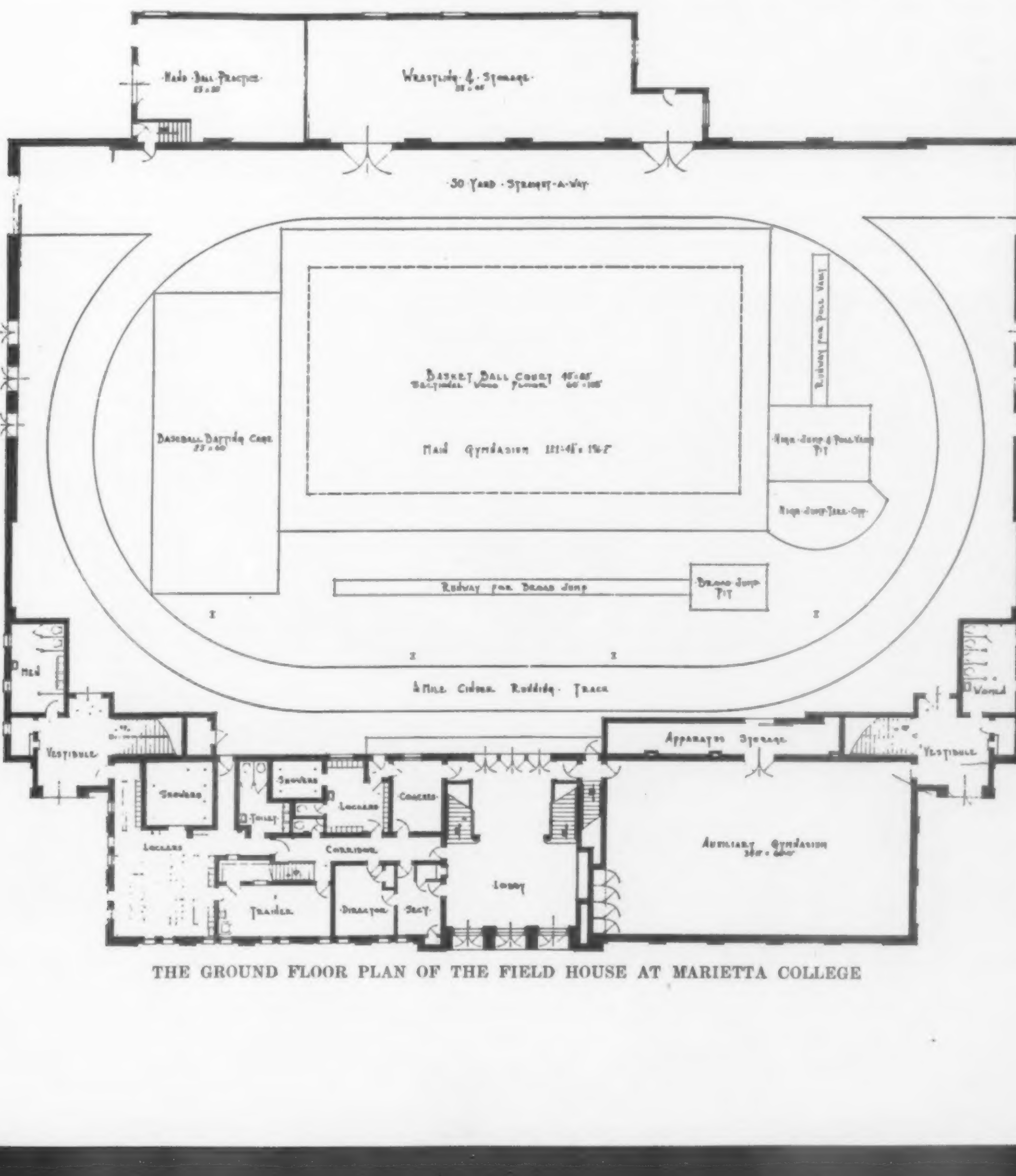
The Field House is built of dark-red brick and steel with limestone facings. Its dimensions are 200 feet by 160 feet, a rather imposing building for a college with an enrolment of 400 students, the plans of which for future development limit the expansion to 500 students.

The main part of the building is the Field House proper, 200 feet by 120 feet, 47 feet in height. In front of it, but built as an integral part of the whole, are the auxiliary gymnasium, locker-rooms, offices, etc.; this part is 160 feet by 40 feet, rising 30 feet in height.

The dirt floor of the athletic enclosure is 200 feet by 120 feet, encircled by a cinder track one-twelfth of a mile in circumference, with a 60-yard straightaway for dashes.

Athletic Facilities

Within the circle of the track is space for the basket-ball floor, a baseball batting cage, jumping and pole vaulting pits. The basket-ball floor is 108 feet long by 60 feet wide, with a playing court 84 feet by 48 feet. The floor rests on steel I-beams placed on 16-foot centers. The beams are supported by heavy wood blocks resting on concrete piers buried in the dirt floor. The basket-ball floor is portable, and when it is removed the concrete piers are covered with earth and the entire area of the Field House proper may be



THE GROUND FLOOR PLAN OF THE FIELD HOUSE AT MARIETTA COLLEGE

ONE OF THE HANDBALL COURTS
The size is 20 feet by 40 feet long. All fixtures are flush with the surface of the wall

used for football or baseball practice. A temporary provision for tennis may be made.

The basket-ball floor is 18 inches above the dirt area when in place. It is enclosed with heavy netting, high enough to keep the ball from going out of the court, but low enough not to obstruct the view of the spectators.

The basket-ball goals are suspended from especially designed steel supports bolted to concrete piers embedded in the dirt floor. There is a distance of 12 feet from the court line to the edge of the floor, and thus no danger of men running into the steel uprights. The goal supports are portable.

Lighting by Day and Night

The trusses are slightly arched, giving a clearance of 34 feet in height. The room is flooded with light from windows placed in all four walls. In three walls the fenestration comes to a level 15 feet above the floor. A row of windows extends along the fourth wall above the permanent gallery. The natural lighting of the room is sufficient to permit amateur movies of basket-ball games to be made. The Field House is illuminated at night by large reflectors that are placed to give brilliant light without shadows. Eleven reflectors lighted with 1,000-watt lamps are staggered above the basket-ball court. Twenty-four reflectors with 1,000-watt lamps illuminate the rest of the room. Each light is controlled remotely from a switchboard. Only the large reflectors are used during basket-ball games.

The gallery seats more than 850 persons. For basket-ball games, bleachers can be placed around the court to handle a crowd of 5,000.

Gymnasium, Offices and Locker Rooms

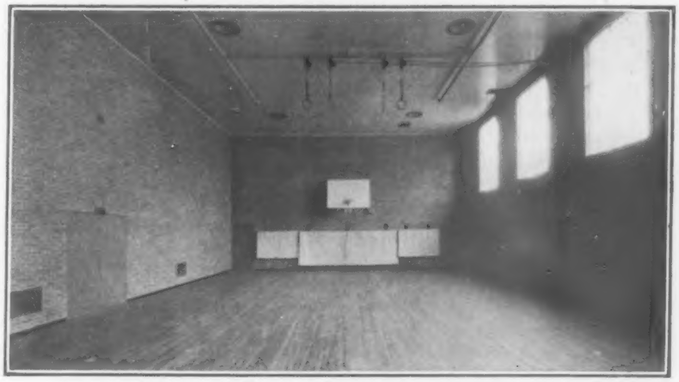
The auxiliary gymnasium at the southwest corner of the building is 61 feet by 36 feet, with a ceiling height of 25 feet. It is used for intramural basket-ball, volley-ball and gymnastics.

THE BASKET-BALL FLOOR IN PLACE
Note the windows above the gallery, and the generous light from the end of the building. There are windows on all four sides. One of the handball courts can be seen at the end of the gallery on the second floor level

Storage cupboards are built flush with the wall. There is a storage room for apparatus between the gymnasium and the large athletic room.

The main lobby separates the auxiliary gymnasium from the offices, locker-rooms, showers, trainer's room, laundry and equipment rooms, which are found in the two-story section in the northwest corner of the building.

On the first floor are the offices of the director and coaches, the varsity locker-room and showers, the faculty locker-rooms and showers, and a completely equipped trainer's room. Above on the second floor are the locker-rooms for the freshman team and the physical education classes, with showers connecting with both locker-rooms. Two classrooms are also on this floor.



THE AUXILIARY GYMNASIUM IS 60 FEET BY 35 FEET

The walls are of buff-colored salt-glazed brick. At the left are seen the doors to the storeroom between the gymnasium and the Field House proper

THE PHYSICAL EDUCATION LOCKER ROOM

The varsity locker-room can accommodate 70 men, the faculty room 40 men, and the freshman and physical education locker-rooms 345 men.

A battery of five instantaneous heaters furnish when and if needed forty gallons of hot water to the showers. Showers are provided with thermostatic control to prevent scalding.

Handball Courts

There are two handball courts located at either end of the gallery on the second floor level. The courts are 20 feet by 40 feet by 20 feet in height. The walls and floor are maple. Two windows in the end of each room give sufficient light during the day. The windows are covered with heavy plate glass set flush with the wall to permit play on all four wall surfaces. Ceiling lights and the hardware on the doors are also flush with the surface. A small balcony overlooks each court.

Other Features

At the rear of the building is a low storage room for the basketball floor, the bleachers and the larger equipment. One end of the room was excavated to give a clearance of 20 feet and is now used for boxing and wrestling. It may later be converted into a handball court.

The interior walls of the Field

THE MEDICAL ROOM, COMPLETELY EQUIPPED

House, the auxiliary gymnasium, the locker-rooms, laundry and equipment rooms, are buff-colored salt-glazed brick. The floors are terrazzo and maple. The walls of the shower-rooms are white tile. Maintenance costs are reduced to a minimum.

There are three public entrances to the building, a main entrance at the west side, another at the southwest, and a third at the northwest corner of the building. All entrances have access to the Field House proper and by stairways to the concourse and the gallery.

The heating of the Field House proper and of the auxiliary gymnasium, offices, locker-rooms, etc., is separately controlled. There are four large unit heaters mounted on the trusses in the main building. Air is forced through copper fin radiators and blown down into the room. Fresh air can be introduced as needed. In the front part of the building the heating and ventilation is handled by large intake and exhaust fans. Fresh air is forced through copper fin radiators heated by steam. Sheet metal ducts lead to the various rooms.

During the construction of the building, conduits were provided for radio and amplification in the Field House, the auxiliary gymnasium and the locker-rooms.

The Marietta Field House is a distinct asset to the community. The Kiwanis State Convention was entertained in the building soon after it was completed, and by reason of its seating capacity other large conventions are being attracted to our historical city.

The cubic content of the building is 1,274,105 cubic feet. The cost, not including land or equipment, was $204,000, a figure which compares very favorably with the estimated cost of the gymnasium originally considered, and the uses of the building reach far beyond those of the former plan.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Boilers—Kewanee Boiler Co.
Classroom Furniture—Marietta Chair Co.
Cleaning Equipment—Finnell System, Inc.
Clocks and Signal Systems—Warren Telechron Co.
Gymnasium Equipment and Furniture—Fred Medart Mfg. Co.
Heating and Ventilating System—Buckeye Blower Co.
Lighting Globes & Fixtures—Cahill Brothers
Lockers—Durabilt Steel Locker Co.
Partitions, Toilet—D. A. Ebinger Sanitary Co.
Piping—A. M. Byers Co.
Plumbing Fixtures—Standard Sanitary Mfg. Co.
Roofing—The Barrett Co.
Showers—Speakman Co.
Valves—Crane Co.

BUILDING SANITATION INTO SWIMMING POOLS

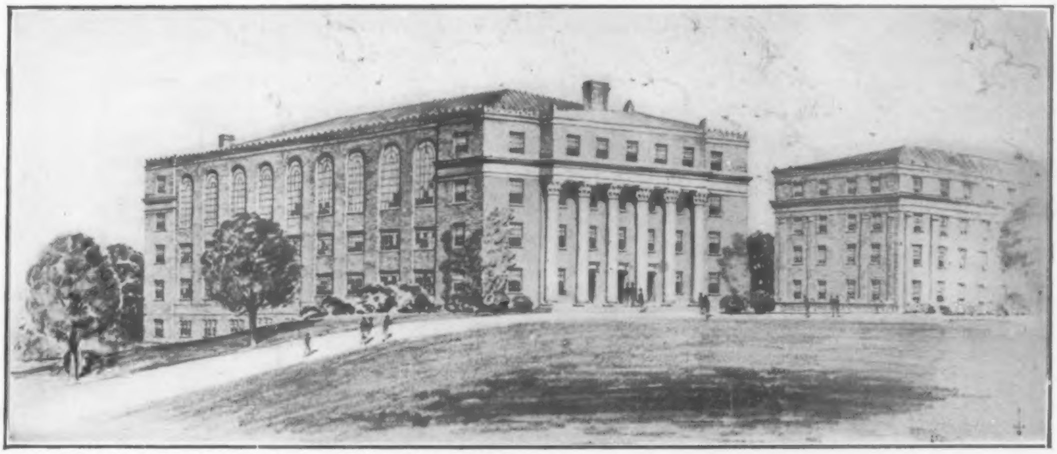
The increasing trend toward the installation and use of swimming pools in schools and colleges has been accompanied by a growing recognition of the health menace of insanitary pools.

The American Public Health Association was early to recognize this. Its first formal action was the appointment in 1918 of a Committee on Swimming Pools in the Sanitary Engineering Section. The reports of this Committee, working jointly with a Committee of the Conference of State Sanitary Engineers, have been of excellent character. The standards established are recognized by health officials throughout the world. For this reason the three outstanding reports of the Joint Committee have been reprinted in a 1930 pamphlet entitled "Swimming Pools and Other Public Bathing Places."

The pamphlet gives in detail the standards for design, construction, equipment, and operation recommended by the Joint Committee in October, 1927, and a Progress Report submitted October 1, 1929, on "Standards for Bathing Beaches and Wading Pools"; also a Progress Report of 1921, on "Extent and Prevalence of Disease Transmission by Swimming."

Chlorination is recognized in these reports as the most satisfactory and economical method of disinfecting swimming pool water. Methods of operating control and tests for excess chlorine and acidity are suggested, in order that the purity of the swimming pool water may approximate as closely as possible to drinking-water standards.

Copies of the above-mentioned pamphlet are obtainable at 25 cents each from the American Public Health Association, 370 Seventh Avenue, New York.



Fiske Kimball, Consulting Architect; Gavin Hadden, Engineer

GYMNASIUM FOR NEW YORK UNIVERSITY, AS PROPOSED

Four University Gymnasium Buildings

BY GAVIN HADDEN, C. E.

THE design of a modern university or college gymnasium is largely a new problem in each specific case. The problem is, however, apt to be one of new applications and new combinations of previously tried elements, and there are certain definite principles and certain definite trends which produce inevitable similarities and differences in all cases. For this reason a knowledge of what has been done and of what is being done elsewhere is of inestimable benefit to those in charge of new projects of this kind.

Two Classes of Facilities

The indoor athletic facilities of the modern university may be housed in one building or in a group of buildings, sometimes physically connected and sometimes separated by considerable distances. The facilities housed in the various units or the different buildings may be divided generally into two classifications: (a) those concerned primarily with athletic activities customarily carried on outdoors but capable perhaps of being carried on indoors during inclement weather or beyond the daylight hours; and (b) those concerned primarily with athletic activities *requiring* through custom or necessity to be housed indoors. The facilities of the former class (a) may include:

- A "field house" or "field gymnasium" or "baseball cage" with dirt floor and high headroom for practice and play of baseball, football, track and field, etc.;
- A "locker building" or "field house" for the use of players taking part in outdoor sports;
- An indoor hockey rink of either natural or artificial ice;
- A riding rink or indoor polo building;
- A covered tennis court building.

When units of this kind stand alone they are often located at some distance from the other more essentially indoor units and can usually be placed with greatest advantage near the outdoor facilities to which they correspond.

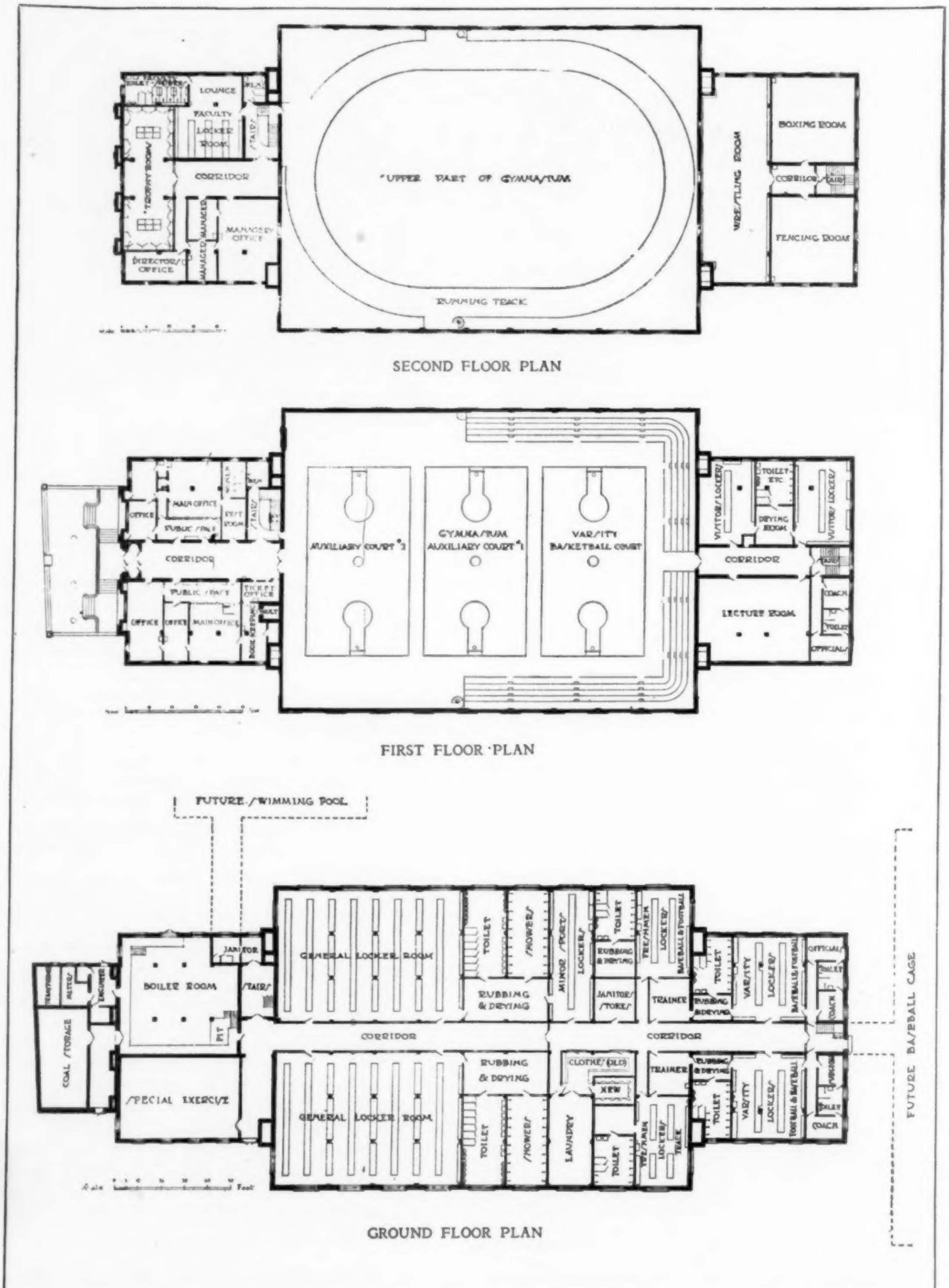
The facilities of the second class (b) may include:

- A large wood floor area with reasonable headroom, capable of use for basketball and other games and for numerous other forms of indoor activities; this room may be furnished with permanent or temporary spectators' seats;
- A swimming pool, or two or more swimming pools, with or without spectators' seats and other spectators' facilities; with full sanitary facilities, such as foot-baths, shower-baths, etc.;
- Locker-rooms, shower-rooms, etc., for all players using the indoor facilities; these may be in either general or team-room suites;
- Rooms for boxing, wrestling, fencing, special exercises, etc.;
- Courts for squash racquets, squash tennis, racquets, handball, etc.;
- Facilities for doctors, trainers, coaches, managers, physical directors, instructors, etc.;
- Service facilities, such as equipment supplies, repairs, storage, laundry, pool filtration and sterilization, heating, ventilating, etc.

It is to buildings of this class that the generic term "Gymnasium" is commonly applied, but these buildings may be known by any one of a number of different names, such as "Athletic Building" or "Physical Education Building." It is obvious that buildings such as these may present complex problems of design, especially when they may be combined with one or more of the units listed in the first classification (a).

The Illustrations

The illustrations show four university gymnasium buildings which are particularly useful in indicating some of the typical similarities and differences that are inevitable in the general design of all buildings of this kind. They are:



Clarke & Howe, Architects; Gavin Hadden, Consulting Engineer

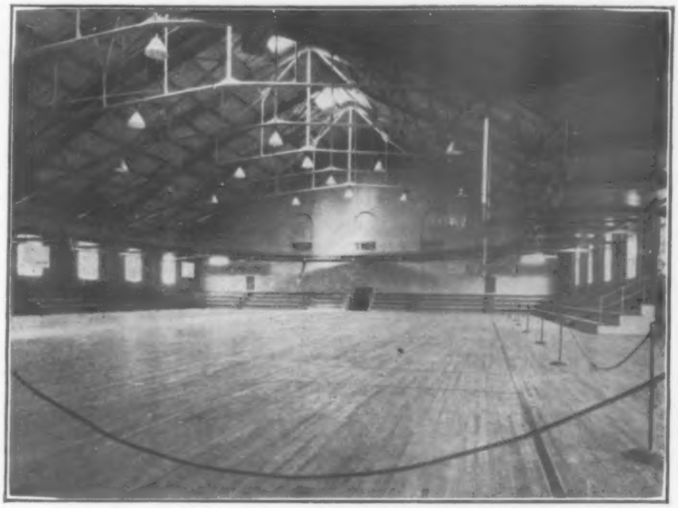
BROWN UNIVERSITY GYMNASIUM FLOOR PLANS

The Brown University Gymnasium, in Providence, R. I., the main portion of which was completed about two years ago;
The Harvard University Athletic Building, in Cambridge, Mass., which, as this is written, is nearing completion;
The University of Rochester Physical Education Building, in Rochester, N. Y., which is also, at this writing, under construction;
The New York University Gymnasium, at University Heights, New York City, which is planned for erection in the near future.

Of these, two, at Harvard and New York University, have sites which are very limited as well as valuable, thus necessitating and justifying buildings carried to a considerable height, with the equivalent of about six and five stories respectively; one, at Rochester, is fortunate in having available a site of considerable area, thus permitting it to occupy a comparatively large ground area, for the most part only two stories high; and the fourth, at Brown, may be regarded as intermediate in character, substantially three stories high.

Basketball Courts

All four buildings provide for practice and play of the game of basketball. At Rochester there are two different floor areas primarily for this game, there being a separate varsity basket-ball arena with permanent seats for spectators; at Brown a comparatively small number of permanent seats for basketball spectators are provided on three sides of the main gymnasium room, to be supplemented by temporary seats at important games; at both Harvard and New York University temporary seats are to be used for all home basketball games.



MAIN GYMNASIUM ROOM, BROWN UNIVERSITY GYMNASIUM

Swimming Pools

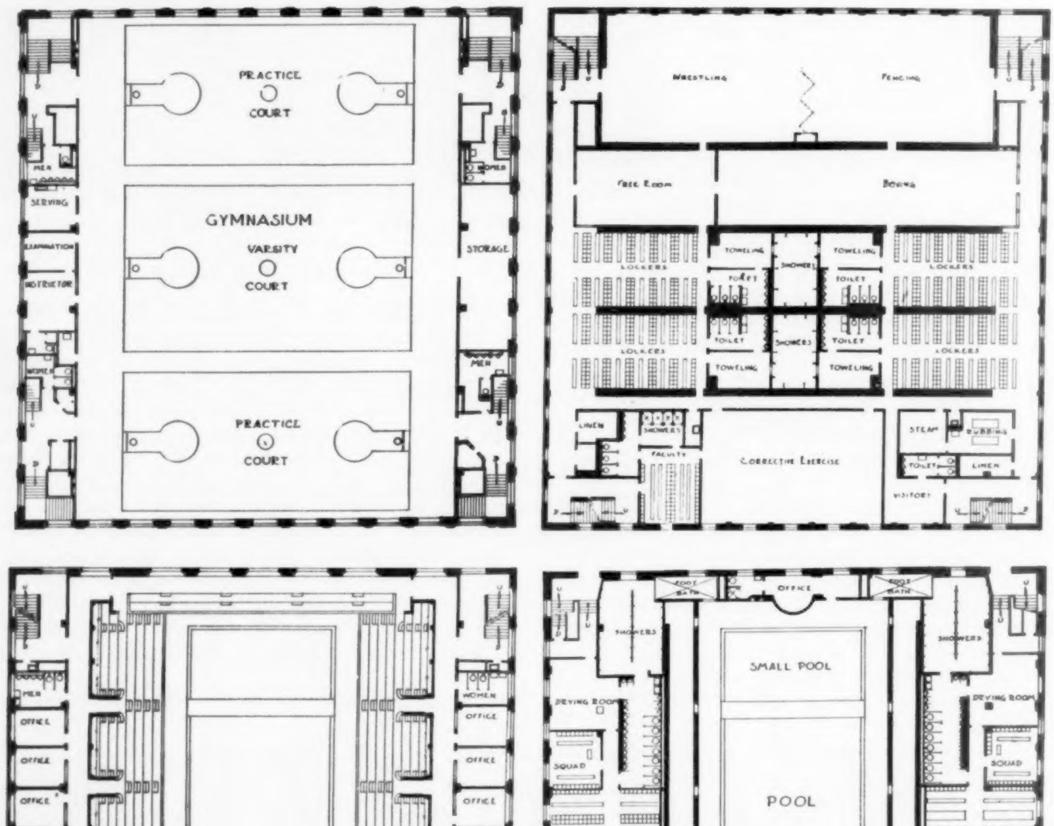
All four buildings are planned to have swimming pools or natatoria, either immediately or in the future. At Brown a new pool is to be located in a future wing, while the existing pool in the old gymnasium building now continues to serve; at Rochester a single double-service pool (for racing, diving, games, etc., as well as for instruction) is provided; while in both the Harvard and the N. Y. U. buildings the two different uses are separated, with a major all-deep pool for racing, diving and games, and a minor all-shallow pool for instruction only. This double pool system is extremely useful wherever the size of the building permits, and materially increases the safety, capacity and efficiency of the installations as a whole.

At the Rochester pool permanent seats are lo-

BROWN UNIVERSITY GYMNASIUM

cated at one end and one side; at the Harvard pools at the two sides, and in a balcony at one end; and at the N. Y. U. pools at the two sides only. At all these pools, some additional spectators can be accommodated with temporary seats on balconies and also at the top of the permanent tiers.

At all the pools the important sanitary and safety provisions have been carefully designed: with the routes of the swimmers entering the pool rooms leading through or by toilets, showers, and foot-baths; with full filtering and sterilizing equipment; with facilities for inspection and observation by swimming instructors, etc. It is also useful to note that the design of all these pools provides for spans carrying the roof or the floors above them clear across both pool and seats, with no obstructing columns between the seats and the pools; that all the pools are provided with an unusual amount of natural light; and also that the space under the seat decks is in each case used to advantage.



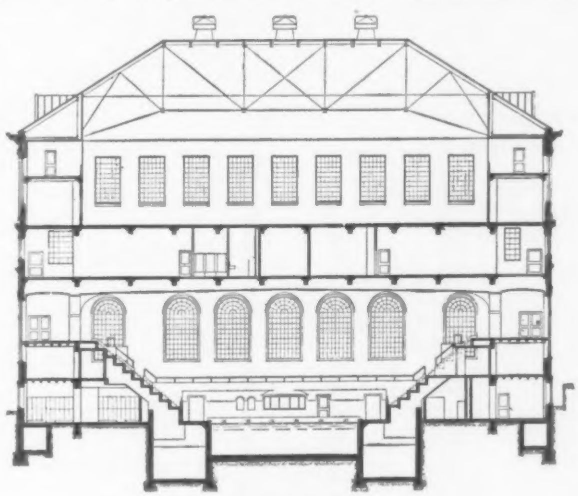
Coolidge, Shepley, Bulfinch & Abbott, Architects; Gavin Hadden, Consultant

FLOOR PLANS, INDOOR ATHLETIC BUILDING FOR HARVARD UNIVERSITY

Gymnasium plan, upper left; gymnasium locker floor plan, upper right; first floor plan, lower left; basement plan, right

Lockers

All four of the buildings of course provide numbers of lockers for those using the athletic facilities, together with the necessary accompanying showers, toweling rooms, toilet rooms, etc. In each case the majority of the lockers are located in one or more "general locker-rooms," while additional units are divided into separate "team rooms." Two radically different locker systems are exemplified: the individual locker system at Brown, Harvard and Rochester; and the "lock-box" system at N. Y. U. With the latter system, instead of assigning a full-size locker for a whole year or a whole semester to each student who uses the building, a comparatively small lock-box only will be assigned, and the lockers in the general locker-rooms will be reserved for temporary use for one afternoon only or even for one hour only, as they may be needed. With the use of the various athletic facilities desired by different students at different hours or on different days, this system, by careful proportioning of the numbers of lock-boxes and lockers, will conserve space very materially, and will increase the potential capacity of the building enormously. The combination padlock system is proposed, whereby the full-size lockers may be used and re-used under normal conditions without supervision by attendants, and whereby the users will not need to carry keys around with them. This system is particularly useful for those using the swimming pool, as the usual method of carrying keys around the neck or wrist is an annoyance and a nuisance.



INDOOR ATHLETIC BUILDING
FOR
HARVARD UNIVERSITY
COOLIDGE SHEPLEY BULFINCH & ABBOTT, ARCHITECTS · [illegible]

Baseball Cages and Running-Tracks

At Rochester a baseball cage or field gymnasium is an integral part of the building; at Brown a unit of this type is planned for future construction; such units are not contemplated in either of the other two buildings, the baseball cage at Harvard being located at some distance from the athletic building, near the outdoor fields.

The Brown building is the only one of the four which retains the old familiar suspended running-track in the main gymnasium room. The difficulties attendant upon the installation of a track of this kind, including the obstruction of the head-room over the floor beneath, and the ventilation problems, have tended more and more to the abandonment of this feature. At the same time the increasing number of field gymnasia (or field-houses or baseball cages) has tended to the installation of indoor running-tracks, with cinder surfaces, in these units, where they are usually more efficient and more satisfactory. In other cases, reliance for running during the winter is placed on outdoor board running-tracks.

The above discussion covers in the main the principal utility features of these four buildings, showing wherein these features are primarily similar or different, with indications of the reasons therefor.

Minor Facilities

In all the buildings there are numbers of other minor facilities, and it will perhaps suffice in this limited space to enumerate under appropriate headings some of those which may be found in one or more of the four:

Athletics:
- Boxing
- Wrestling
- Fencing
- Special or corrective exercises
- Squash courts

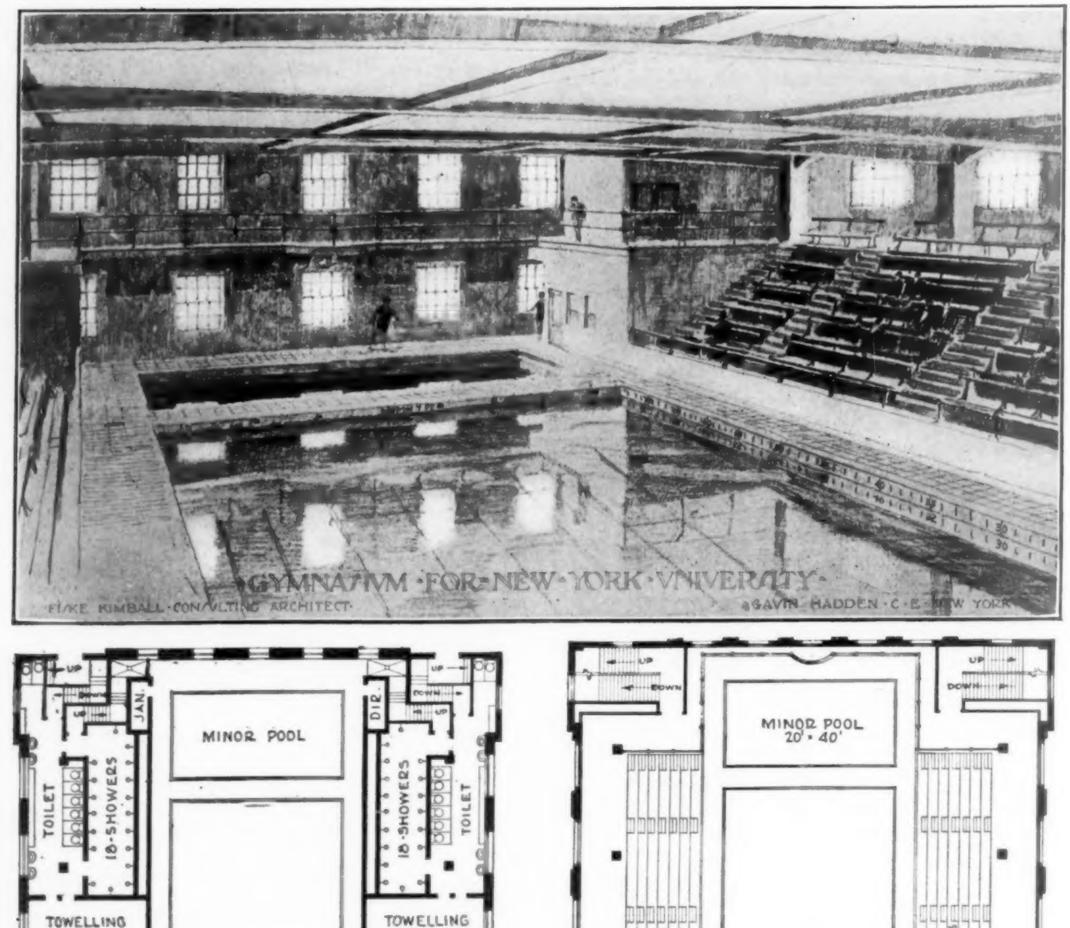
Spectators:
- Check rooms
- Toilets
- Entrances, exits, tickets

Administration and Supervision:
- Managers and physical directors
- Doctors
- Coaches
- Trainers
- Lecture rooms
- Trophy rooms

Equipment and Service:
- Towel issue
- Equipment storage and repairs
- Laundry
- Heating
- Ventilating
- Pool equipment

General Considerations

Careful consideration has been given in the design of each of these buildings as a whole to the requirements of the university which it is to serve; to the facilities required as determined by past experience both locally and elsewhere, by the facilities already available in other buildings, by the wishes, habits and traditions of the undergraduates, by the athletic policy of the institution, by land areas available, and so on. Also, in the design of each unit and each combination of units, the determination of the materials to be used, the details to be included or omitted, advantage has been taken of familiarity with numerous installations elsewhere, in the effort to retain what has been proved to be excellent and eliminate what has been proved to be disadvantageous. In all these matters the aid and counsel of the directors and administrators of athletics



SWIMMING POOL AND FIRST AND SECOND FLOOR PLANS OF THE NEW YORK UNIVERSITY GYMNASIUM

has been invaluable to the architects and engineers.

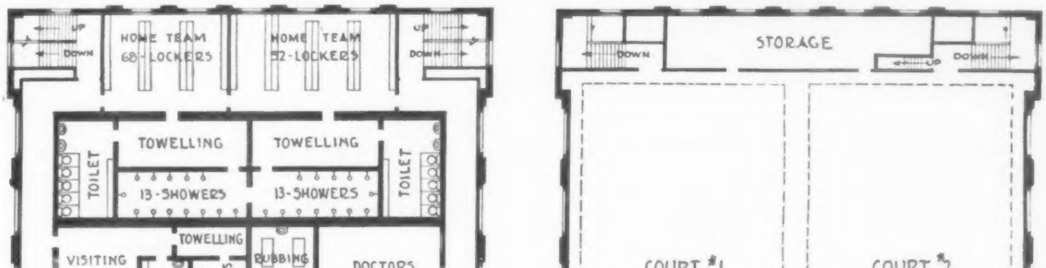
The Exterior Appearance

In addition to the utility features, and inseparably linked with their design, are the considerations of the appearance of the buildings as a whole. In the case of the usual university gymnasium the architectural style of the exterior is predetermined by the general style of the existing or proposed buildings with which it is to be grouped; so the Harvard Athletic Building, the Rochester Physical Education Building and the New York University Gymnasium, though all are quite different in the treatment of their exteriors, have in each case been governed by previously adopted styles. So also the general architectural treatment of the Brown Gymnasium, although it is located quite apart from all the other University buildings, has been determined by conformity to an older type of architecture long familiar in its New England setting.

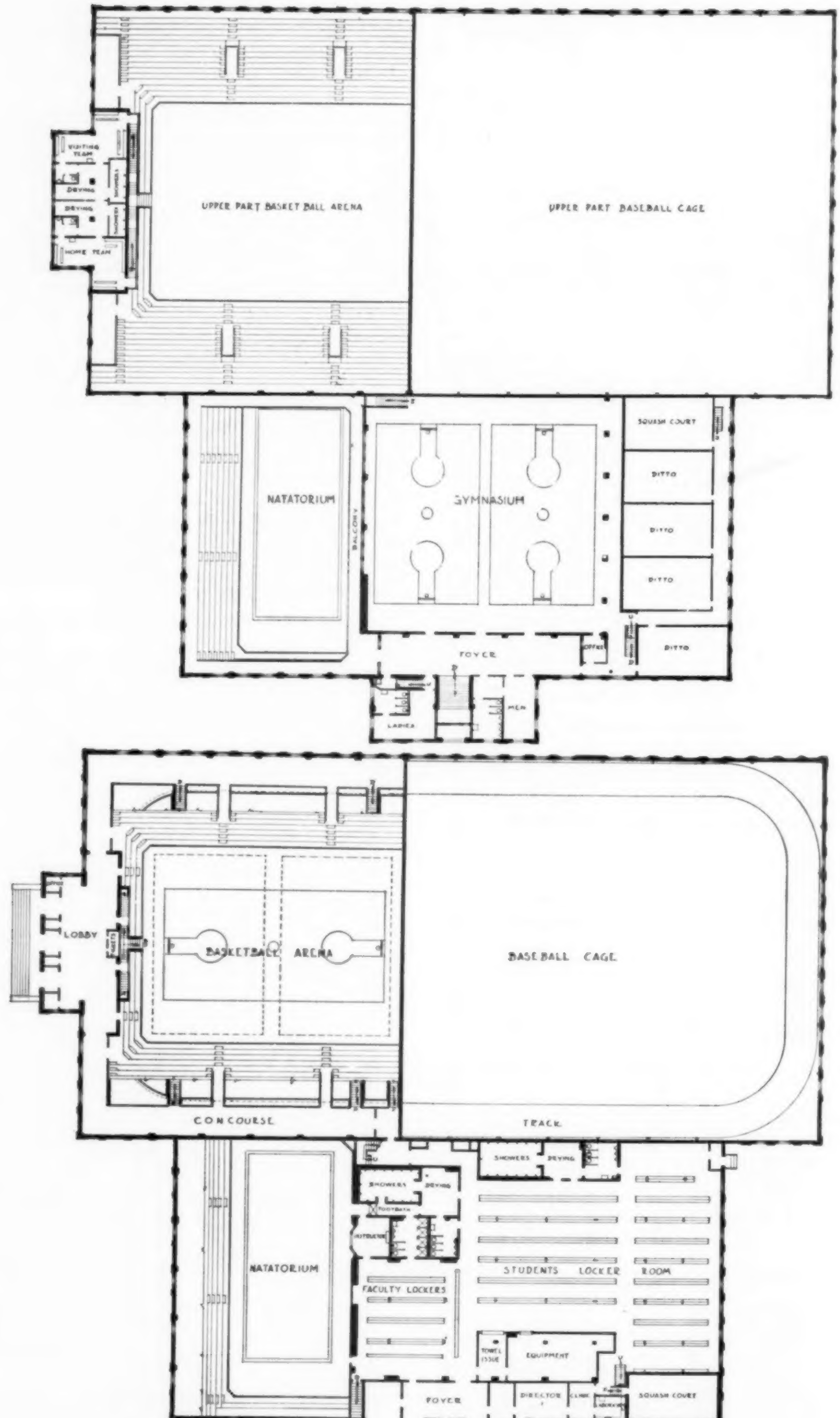
In the taller buildings such as those at Harvard and N. Y. U., with their required economy of land and their substantially rectangular ground plans, there is not the same opportunity for attaining interest and distinction by formal or informal groupings of masses and by variations in roof lines as is found in others, such as those at Brown and Rochester.

The Interior Appearance

In the interior of these buildings, except for an occasional trophy or lounge room, there is rarely any place where loitering should be encouraged, and therefore restful comfort or inactivity cannot properly be made a keynote of the design. On the contrary, cheerful activity and recreation, efficient utility, and, above all else, sanitation and cleanliness, are necessarily ruling considerations, and it is believed that the interiors of the various units, when they are made as useful and efficient, as light and airy, and as clean and sanitary as possible, inevitably tend to reach the greatest suitability and truest beauty. As President MacCracken of Vassar College truly said in a discussion of the design of buildings for Physical Education, in The American School and University for 1929-1930, the housing of physical education and athletics in a beautiful building "need not make the building more expensive. True beauty is also highest economy."



THIRD AND FOURTH FLOOR PLANS FOR THE NEW YORK UNIVERSITY GYMNASIUM



Gordon & Kaelber, Architects; Gavin Hadden, Consultant

FIRST AND SECOND FLOOR PLANS, PHYSICAL EDUCATION BUILDING, UNIVERSITY OF ROCHESTER

Playgrounds on the Ground and in the Air

BY JOHN C. KIEFFER

SPECIAL ASSISTANT TO THE DIRECTOR, DIVISION OF PHYSICAL AND HEALTH EDUCATION, PHILADELPHIA PUBLIC SCHOOLS

AMONG the many significant developments in education during the last quarter-century has been the growing recognition given to physical education. This recognition, now almost universally conceded, was earned after years of struggle. Among the greatest handicaps encountered has been the relatively large costs involved in providing facilities. Following the lead of the colleges, Turn Vereins, and Y. M. C. A.'s, it was felt that gymnasiums were essential in the schools. Close upon the heels of this demand came the cry for play space outdoors.

In Philadelphia the Board of Public Education early recognized this need, and has been meeting it with ever increasing consideration in the purchase of sites for new schools. Where such sites are located in new or partially developed sections of the city, the expense has not been prohibitive; but where an old building is supplanted by a new one in a section with high land values, the only solution to the play space problem has been the roof playground.

Seventeen Schools in Philadelphia Have Roof Playgrounds

There are at the present time in Philadelphia seventeen schools having roof playgrounds. In all but a few there is but one play space on the roof. The newest roof playground has four separate spaces. The average play space is 45 feet wide and 60 feet long.

The cage covering each play space is built of heavy galvanized pipe arranged in rectangular sections. Between these pipes on the sides are screens made of No. 10 wire woven in a 2-inch diamond mesh. The screens for the top are made of No. 16 copper wire woven in a 1½-inch hexagonal mesh. These sections are approximately 12 feet long and 5 feet wide. The vertical posts are fastened through the roof slab by ¾-inch bolts or by ¾-inch cinch bolts. The vertical pipes are 3 inches in diameter, while the horizontal pipes are 2 inches in diameter. The maximum height from floor to ceiling is 23 feet. The curve of the top begins at a height of 12 feet and is that of a true elipse.

The floor of the play space is built on the poured concrete slab roof of the building. A cement fill of about 5 inches is poured on top of the slab roof. The grade of this fill is ⅛-inch to the foot and a 4- or 5-inch drain pipe is placed for approximately every 200 square feet of surface. Applied to the fill is a four-ply pitched waterproof membrane. The square tiles used for a top surface are laid when the waterproofing material on top of the membrane is still soft. Finally, a waterproof cement is poured into the joints between the tiles. Running the length of the space and through the middle is an expansion joint. Transverse joints are provided about every 30 feet.

How the Roof Playgrounds Are Equipped and Used

Usually each roof playground is provided with basketball goals and backstops and volleyball eyelets fastened to the frame of the cage. In addition, there may be portable volleyball standards. Where there is adequate protection in the form of a corridor, closet, or room adjacent to the play space, high-jump standards, jumping mats, take-off boards, and mat hangers are provided exclusively for use in the roof playground. The amount of equipment provided depends upon what other physical education facilities are provided in the building. The court markings for basketball, volleyball, dodgeball, and captainball are always painted on the floor.

These valuable spaces are extensively used for class work in physical education, for organized after-school play, and for purposes of relaxation in the fresh air during lunch periods.

In junior high schools having roof playgrounds, intramural programs of sports utilize these spaces to the utmost. The games played consist of volleyball, basketball, captainball, baseball (soft ball), touch football, and shinny. These games are managed and officiated by pupil leaders trained for this purpose.

In the elementary schools programs of after-school games are also conducted by pupil leaders under the supervision of teachers who volunteer this service. For recess periods the roof playground offers splendid possibilities, providing the space is not crowded with too many children at one time.

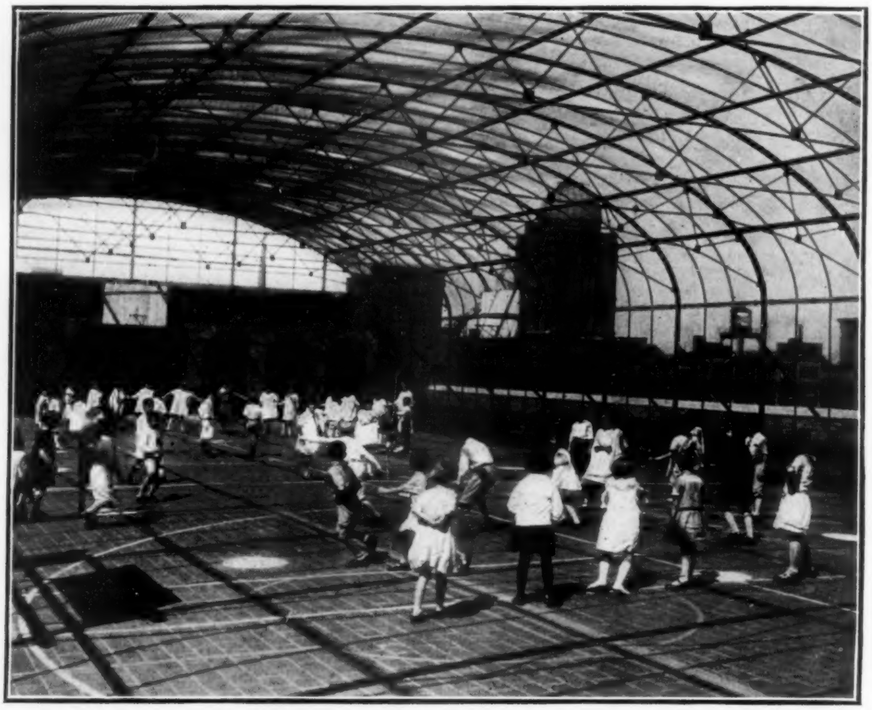
Such roof play spaces ought to be accessible to adults for recreation during hot summer months, especially in the evening. However, to make this practical, stairways leading from the street to the roof should be located so as to avoid tracking through the school building.

School-Year Playgrounds on the Ground

The school-year playgrounds aim to provide opportunities for organized and supervised play outside of school hours to children in the elementary schools. Since the activities used to accomplish this aim involve games of vigorous muscular activity, this phase of the physical education program is an important one.

To meet varying local conditions in Philadelphia during the last school year, one group of five playgrounds operated for one hour, and another group of thirty-eight playgrounds operated for one and one-half hours. On Saturdays, twelve playgrounds operated morning and afternoon, and twenty-two operated during the morning only.

The activities conducted in these playgrounds consisted of volleyball, dodgeball, captainball, playground baseball, endball, broom hockey, touch football, kickball, soccer, and a great variety of games of lower organization. For the games of higher organization, teams and leagues were organized. The team games were played daily according to a definite schedule arranged by the playground teacher.



ORGANIZED PLAY ON THE ROOF PLAYGROUND OF THE THADDEUS STEVENS SCHOOL, PHILADELPHIA

Playground Apparatus

The equipment of public school yards with playground apparatus is a problem that must take many factors into consideration and be solved on the basis of certain fundamental principles.

Among the factors which most commonly influence the selection and purchase of equipment is that of cost. Where funds are limited, it is immediately necessary to choose apparatus on the basis of its relative values. These may be expressed in terms of the physical and recreational benefits derived from the use of a piece of apparatus; they may be expressed in terms of the number of children that may be accommodated in a unit of time; they may be expressed in terms of the length of time children remain in the playground; or, finally, in terms of the frequency of visits made by children to the playground.

Where the aim of the play program is merely to provide a safe place for children to be and enjoy themselves, the number of children to be accommodated would probably be of primary consideration. However, where the program of activities is built on the philosophy that the natural play of the children can be made educational as well as recreational, such equipment as attracts children to and holds them in a playground is very valuable. The fact that some apparatus provides opportunities for valuable physical exercise, social adjustment, and mutual cooperation, gives further help in selecting what should be purchased.

Of equal importance with the factor of available funds in equipping school yards with play apparatus is that of the local needs of the school and community. The total number of pupils and the distribution of them into age groups or sexes will have much to do with what apparatus is selected.

Very often there may be sufficient funds available, but not space for the installation of desirable equipment. Therefore, the size of the space and the shape of the space are very important factors in this connection.

How Philadelphia School Yards Are Equipped

In Philadelphia many school yards are equipped with one or more of the following pieces of apparatus:

Large swings (4 seats)
Small swings (6 seats)
Giant stride (8 ropes and chains)
Horizontal bars (one 4 feet 6 inches and one 5 feet 3 inches high)
Climbing frame
Teeter frame (two boards)
Large slide (7 feet high, 20 feet long)
Small slide

AN AFTER-SCHOOL PLAYGROUND, PHILADELPHIA

Locating the Apparatus

In locating any of the pieces of apparatus indicated above, the following principles are always kept in mind:

1. Safety of the children is the first consideration. Swing frames are put sufficiently far away from fences or neighboring buildings to avoid any possibility of the children's hitting them while swinging. If a frame is eight or ten feet high, it is placed ten feet from the fence or wall which parallels it. Large slides are placed at least six feet away from the nearest parallel fence or wall, and horizontal bars are usually placed seven or eight from the nearest parallel wall or fence. Giant strides are usually located in a corner of the yard where a circular free space of twenty feet radius may be had.

Not only must apparatus be located safely with reference to wall or fences, but also with reference to the lanes of traffic used by children. The nature of the activity peculiar to the apparatus will also determine how much space and what locations are necessary for safety.

2. Apparatus should be so placed that it can be easily supervised, either by a playground teacher in the yard or by someone watching from within the school building. In most cases this means grouping the apparatus in one or two parts of the yard which can easily be watched from one central point.

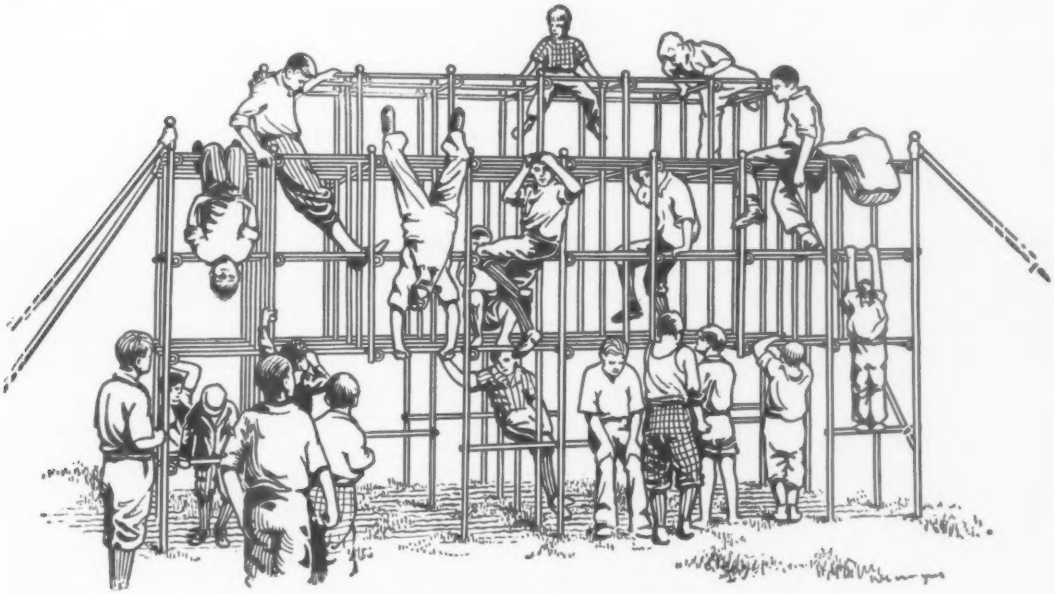
3. The most efficient use of the yard space with reference to game courts, entrances or exits, presence of trees and fences, should influence the location of play equipment. Apparatus should be located so as to avoid being in direct paths of children using fire exits, doorways, yard entrances and exits.

4. Some grouping of apparatus for large and small children should be observed.

5. The location of apparatus should be such that it is in the shade of the school or other buildings or trees during a good share of the day.

6. Wherever possible, play apparatus should be located where at least part of it is visible from the street so that children in passing will see it and be attracted into the playground.

In planning the locations of any play apparatus, perhaps no help is so valuable as that gained from a close study of the factors involved and the underlying principles.



THIS IS JUNGLEGYM NO. 1—PRICE $320.00 F. O. B. FACTORY

JUNGLEGYM OWNERS TELL THE STORY

"Has never been an accident. **Think it the safest piece of apparatus made."**—Neva L. Boyd, Director, Hull House, Chicago.

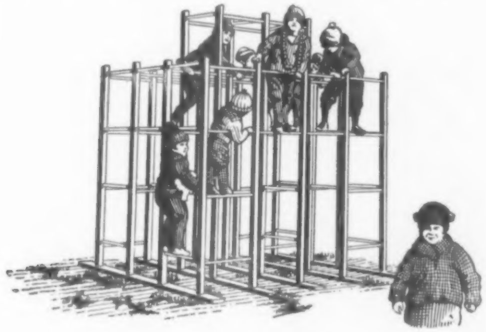
"Retains its popularity after several years of use. **Would sooner part with all the rest of our playground apparatus than with Junglegym."**—C. W. Washburne, Supt. Public Schools, Winnetka, Illinois.

"Requires little supervision. Develops the children physically. **As much interest now as when first installed."**—James V. Mulholland, Supervisor of Recreation, Borough of Manhattan, N. Y.

"Children do not tire of Junglegym. Absolutely safe to play on."—J. S. Wright, Director of Physical Education, Chicago, Illinois.

"We recommend it heartily. **Entirely safe.** Interesting to the children."—Margaret F. Coe, Supervisor Intermediate Dept., The Park School, Baltimore, Md.

"Our little boys like the Junglegym as much as ever."—Edward E. Allen, Director, Perkins Institute for the Blind, Watertown, Mass.



JUNGLEGYM, JR.
SELECTED WOOD—$65.00
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JUNGLEGYM, JR., NO. 5
GALVANIZED STEEL PIPE—$125.00
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From the very inception of the playground and recreation movement in the United States, Spalding has led in the development and manufacture of apparatus.

Spalding equipment is rugged. "Good enough" will not do—it must be of the highest quality.

Spalding equipment is carefully and scientifically designed. The various pieces are made to be just right for the children who are to use them. Sizes and spaces are correct, materials of full strength with a large factor of safety, design clean to avoid any danger from projecting pieces, bolts, nuts, etc.

PLANS

We offer, without charge or obligation, engineering service on designing complete recreation layouts. It is only necessary to give us all facts available, sketch of grounds with dimensions, and if possible, the topography contours.

PRICES

We are prepared to figure on supplying and installing the complete equipment of apparatus including pipe frames.

If preferred, we will quote on all apparatus and frame fitting of design f. o. b. factory or freight paid to destination. In such case we will supply all necessary erection instructions and blue prints, also complete specifications of galvanized pipe required to construct frames so that you can obtain the correct type and sizes of pipe from local supply houses.

GENERAL OBSERVATIONS

Playgrounds should be placed at points convenient to the children, as, for instance, near to the schoolhouses, assuming that they are properly placed to serve the people most conveniently. Experience has shown that children will not, in any number, travel more than a quarter of a mile to a playground.

Boys and girls should have separate spaces. Fences should be used, one gate entrance to each, to give the director full control. Playgrounds of all kinds should have a trained play teacher in charge, not a policeman or janitor.

The smaller children under ten can usually be counted on to play in one corner of the girls' space. Usually an older sister has them in charge. Also the type of play and games conducted by the girls is safer for the little ones. In this corner we should have a sand pit and a shallow wading pool.

Sanitary bubble drinking fountains should be provided in each of the spaces.

Comparatively few playgrounds are properly shaded. **Trees are absolutely needed** in the hot days of summer if the playground is to be used. A bare, hot playground is about the most unattractive spot in the city.

We show here by way of illustration a suggestion for a neighborhood playground embodying some of the special desirable features mentioned.

Observe the low fence around swing frames. This will serve greatly to prevent accidents to children from running heedlessly into the flying swings.

We shall be pleased to correspond with you in regard to any recreation plans or developments.

Service Bulletins giving special information on any detail of recreation promotion or facilities, standard or typical plans in blue-print form of athletic fields, baseball diamonds, football, soccer, basket-ball, tennis courts, or special layout plans of equipment for your playgrounds or gymnasium, will be sent on request.

Catalogs sent on request.

SUGGESTION FOR A NEIGHBORHOOD PLAYGROUND ADJOINING PUBLIC SCHOOL

A. G. SPALDING & BROS.

GYMNASIUM CONTRACT DEPARTMENT

CHICOPEE, MASS.

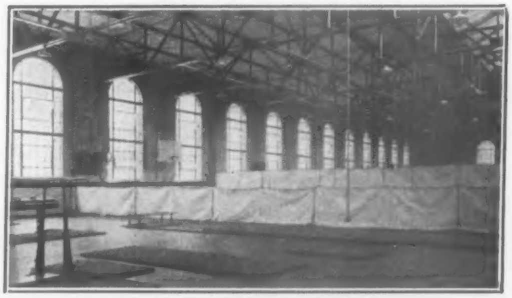
We have been manufacturing and installing the finest types of gymnasium equipment for almost forty years.

Our Engineering Department will be pleased to assist you without any obligation, on all details of the planning and outfitting of your gymnasium. We take pride in our mechanical ability to construct variations of apparatus or means of installing to give the utmost efficiency in use.

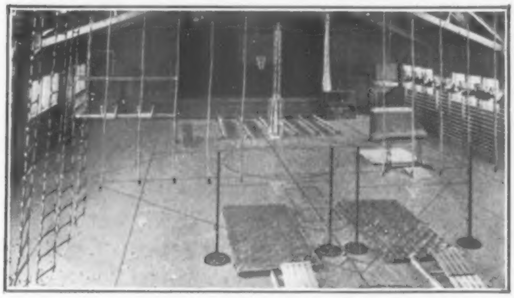
BOYS' GYMNASIUM
WICHITA, KANSAS, HIGH SCHOOL

GIRLS' GYMNASIUM
WICHITA, KANSAS, HIGH SCHOOL

HUTCHINSON GYMNASIUM
UNIV. OF PENNSYLVANIA, PHILADELPHIA



HUTCHINSON GYMNASIUM
UNIV. OF PENNSYLVANIA, PHILADELPHIA



DANA HALL PREP. SCHOOL
WELLESLEY, MASSACHUSETTS

Y. M. C. A. GYMNASIUM
MONTCLAIR, NEW JERSEY

WALLACE & TIERNAN CO., INC.

NEWARK, NEW JERSEY

Manufacturers of Chlorine Control Apparatus Water Sterilization and Swimming Pool Sanitation

SALES OFFICES AND SERVICE HEADQUARTERS

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Oklahoma City, Oklahoma—1631 W. 23rd St.
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Pittsburgh, Pennsylvania—Hardy & Hayes Bldg., 233 Oliver Ave.
Roanoke, Virginia—318 Mountainview Terrace, Virginia Heights
San Francisco, California—7 Front St.
Seattle, Washington—411 Lloyd Bldg.
Spokane, Washington—724 Realty Bldg., 242 Riverside Ave.
St. Louis, Missouri—605 Star Bldg., 12th and Olive Sts.
Syracuse, New York—301 State Tower Bldg.

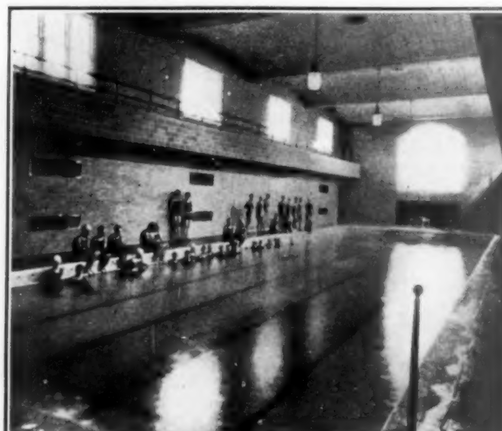
FOREIGN

Canada, Wallace & Tiernan, Ltd., Toronto, 32-34 Front St. West
Canada, Wallace & Tiernan, Ltd., Winnipeg, 813 Royal Bank Bldg.
England, Wallace & Tiernan, Ltd., London E. C.-3, 16 Water Lane
Argentine, Geo. C. Robertson, Buenos Aires, Avenida de Mayo, 760
Chile, Anjel Guarello Gallo, Santiago, Casilla 2809
Cuba, Daniel, Inc., 814 Edificio Metropolitana, Habana
Porto Rico, Del Valle & Co., Apartado 116, San Juan

Swim in Drinking Water

Swimming has now become a part of the physical educational program of the modern School and University, and today all the better schools are equipped with modern swimming pools. Likewise the sterilization of swimming pools by liquid chlorine and W & T Equipment is thoroughly established. Close to 2,000 swimming pools are protected by W & T sterilizers and the bathers are swimming in water fit to drink.

W & T EQUIPMENT STERILIZES THE SWIMMING WATER AT DARTMOUTH COLLEGE



THE SWIMMING POOL AT COLUMBIA HIGH SCHOOL, SOUTH ORANGE, MAPLEWOOD, NEW JERSEY, IS EQUIPPED WITH A W & T STERILIZER

A properly operated filter will remove all of the dirt, color, turbidity and suspended material from the water. It will deliver a clear, sparkling water to the pool. But a filter will not destroy the germs that are washed from the body of bathers into the pool water. It will not destroy the microbes of disease that might get into the water from one bather, which when transmitted to other bathers might cause disease.

"The Only Safe Water Is A Sterilized Water."

Chlorination—the Best Method of Swimming Pool Sterilization

"From all available information the addition of chlorine—by the use of proper apparatus, is today the most satisfactory method of pool disinfection" — so states the report of the Joint Committee of State Sanitary Engineers and American Public Health Association after five years' careful study.—And the report goes on to tell why—"because of the residual sterilizing action of chlorine.

W & T TYPE MSP CHLORINATOR USED TO STERILIZE THE AVERAGE SCHOOL POOL

Higher endorsement could not be had.

This endorsement is because chlorination—and chlorination alone—provides continuous sterilization throughout the entire pool. Bear in mind that the filtered, sterilized water, the moment it enters the pool and comes in contact with a bather, is again liable to pollution which will carry through the pool, increasing as the water nears the outlet. Some means must be provided to destroy this pollution and prevent the possibility of its spreading disease during its travel through the pool.

This is accomplished by chlorination.

A properly operated pool will have in the pool water at all times just sufficient residual chlorine to destroy the microbes of disease. There is not enough to be noticed—the most sensitive bather cannot detect it. But there is enough there to kill a germ that is washed from the body or mouth rinsings of one bather before that germ can come in contact with another bather!

Convenient, simple apparatus is furnished for testing the pool water to determine the amount of residual chlorine.

Twenty-eight indoor swimming pools were recently examined by the Detroit Health Department. Three of them contained water purer than required by the United States Public Health Service for drinking water.

And each of these three chlorinated the water!

The pools were ranked in accordance with their purity.

Each of the first ten pools chlorinated!

Seventy-five indoor swimming pools were recently examined by the New Jersey State Department of Health. FIVE of them were found to contain water sufficiently pure to meet the drinking-water standards of the United States Public Health Service.

And each of these FIVE chlorinated the water!

That is why health officials everywhere endorse chlorination.

A W & T MSP CHLORINATOR IS INSTALLED IN THE SWIMMING POOL OF THE NEW DE WITT CLINTON HIGH SCHOOL, NEW YORK CITY

And just as chlorination is the accepted and preferred method of swimming pool sterilization, so is Liquid Chlorine and W & T apparatus the preferred method of chlorination. That is because liquid chlorine is easily handled, always full strength, universally available, while the W & T sterilizer for controlling the application of the liquid chlorine is automatic, fool-proof, simple, durable. Once placed in operation, it stays in operation.

Liquid chlorine and W & T swimming pool sterilizers remove the guesswork from swimming pool sanitation.

The sterilization of water by liquid chlorine and W & T equipment is thoroughly established. There are nearly 10,000 installations of W & T apparatus, sterilizing upwards of five billion gallons of drinking water each day. Every drop of drinking water delivered to over 3,000 communities in North America is sterilized with liquid chlorine. These public water supplies through chlorination meet the requirements of the United States Public Health Service for drinking water—while in just the same manner, in close to a thousand swimming pools are protected by W & T sterilizers, the bathers are swimming in water fit to drink.

The almost universal use of W & T apparatus and liquid chlorine to sterilize public water supplies and swimming pool water has brought about Wallace & Tiernan's country-wide organization of trained public health engineers, each thoroughly conversant with all problems of water purification and each available to cooperate without charge with architects, engineers and owners interested in swimming pool sanitation.

Hundreds of the leading Schools and Universities in North America are using W & T swimming pool sterilizers.

Wallace & Tiernan manufacture a complete line of Swimming Pool and Water Supply Sterilizing Equipment. We will be glad to send detailed information to any address upon request.

BRADLEY WASHFOUNTAIN CO.

2231 Michigan Street, Milwaukee, Wis.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Manufacturers of Fixtures for Group-Washing

TYPE "A", 54"
Capacity, 10 persons

TYPE "F", 54"
Capacity, 6 persons

Bradley Washfountains are designed for group-washing. They provide hygienic means for washing hands, shoulders and face, without splashing or spilling water on floors or walls. Their use assures sanitation and cleanliness, saving in fixtures, time in washing, floor space, water economy, janitor attendance, elimination of repair and replacement expense.

Bradley Washfountains are made in various types, sizes and grades so that they are adaptable to any washroom requirement. Made in circular and semi-circular form in varying sizes they will fit into any washroom and occupy 25% less space than any other washing equipment serving the same number of people. They can be obtained with foot-control of water which automatically shuts off the supply when the users leave the bowl.

A group of ten people washing at one time at a Bradley Washfountain use little more water than one person washing at an individual faucet.

At Left—54" Type "A" fountain equipped with liquid soap dispenser installed at Hughes High School, Cincinnati, Ohio. Note that there is plenty of room for at least four more persons.

At Right—Two 32" Type "A" fountains installed in girls' lavatory help keep down janitor expense and result in savings on water bills as high as 80 per cent.

The specially-designed Bradley Playground Shower, for use on school playgrounds provides safe and healthful recreation for the children, with its cool, refreshing spray.

Special Bradley Footfountains made for use in schools, orphanages, and institutions where foot bathing is an object. Illustration shows a group of negro children foot bathing at the St. Benedict The Moor Mission, Milwaukee, Wisconsin.

Literature giving partial list of school installations and catalog will be mailed upon request.

GENERAL UTILITIES MFG. CO.

4058 Beaufait St., Detroit, Mich.

"The Electric Towel"

MODERN — SILENT — SANITARY

Modern schools, playgrounds and swimming pools have adopted the "Electric Towel" as the new, sanitary method of drying the hands and face.

The improved "Electric Towel," a development of ten years by the originators of electric hand drying, is now offered in new and attractive models for the consideration of school principals and superintendents, playground commissioners and architects who desire the last word in safe, sanitary and efficient washroom equipment.

BUILT-IN WALL TYPE

Cut Cost 60% to 80%

The economy of the "Electric Towel" as compared with cloth or paper towels, and the atmosphere of cleanliness and good order that it imparts to the wash room are factors which make it a popular addition to the school and playground wash room.

Actual savings effected by the use of the "Electric Towel" are from sixty to eighty per cent. With this machine janitor service in the wash room may be dispensed with because there are no unsightly litters of discarded cloth or paper towels to be gathered up or swept out.

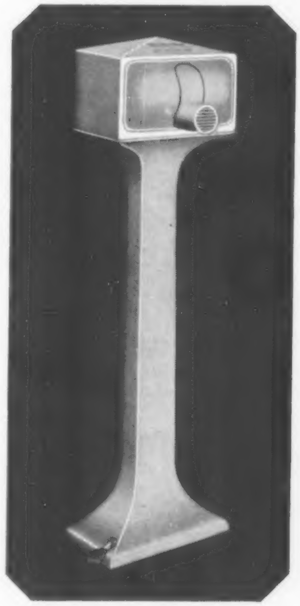
Investigation of the comparative costs of drying service shows that one thousand "dries" with the "Electric Towel" cost 30¢, as compared with $5.00 for cloth towels and $3.35 for paper.

The General Utilities Mfg. Co. will be glad to assist your community in planning the most effective use of "The Electric Towel" for your school, playground or swimming-pool wash room.

WASH ROOM EQUIPPED WITH RECESSED WALL TYPE

Standard Pedestal Type

This model of the "Electric Towel" is the one most generally used in schools, playgrounds and bathhouses where the character of construction does not lend itself easily to the "recessed wall type." It is made of pressed steel and is finished in pure white porcelain enamel, giving it a handsome, clean appearance that harmonizes well with the other sanitary fixtures of a well-ordered lavatory or wash room. The adjustable nozzle may be moved up or down as required in order to deliver its stream of clean, electrically heated air either to the hands or face. The operation is controlled by a foot pedal, placed so as to provide maximum of ease to the user.



STANDARD PEDESTAL TYPE

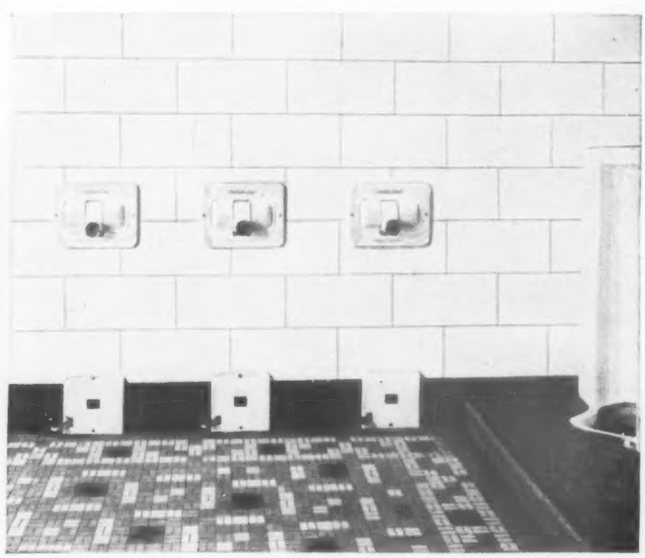
The Gymnasium Hair Dryer Model

This style of Electric Towel should be installed in all schools where swimming is taught in connection with gymnasium work. Every school must as a matter of duty take precautions against epidemics of colds which can start quickly when the pupils attend class rooms after swimming and get their hair wet. This Model Electric Towel is a very necessary installation in modern school gymnasiums.

The Recessed Wall Type

The built-in model "Electric Towel," also with adjustable nozzle and foot-pedal control, is now specified by leading architects throughout the country on up-to-date gymnasium, playground and swimming-pool wash rooms. The constant improvement of the "Electric Towel" G. E. motor over a period of ten years makes it absolutely free from vibration, so that it is now practical to install it in the wall. Contrast the appearance of a wash room equipped with unsightly cabinets for paper towels or racks for cloth towels with one equipped with the "Electric Towel" recessed in the wall and harmonizing perfectly with the snow white wall and other fixtures.

THE GYMNASIUM HAIR DRYER MODEL

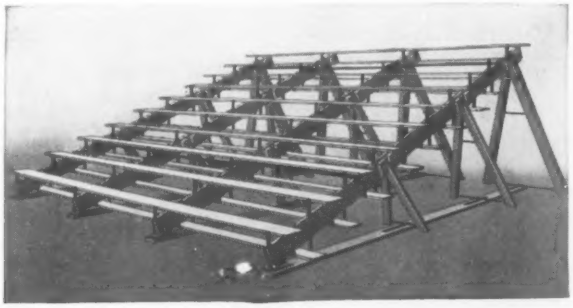


MODERN LAVATORY "ELECTRIC TOWEL" EQUIPPED

Giant Playground Apparatus is safe and combines all of the fun and health building features essential for the enjoyment of young children. Affords them clean and healthy exercise and eliminates the danger of playing in the streets.

Giant Flood Light Projectors have been tested and proved the most satisfactory type for all night athletics. They are glare-free and diffuse perfectly the light of the lamps, providing a soft, mellow flood of light which eliminates shadows. Manufactured in many sizes.

Fence for the school yard, playground, athletic field, tennis court, etc. Made in various types to fill every school need. Giant Fence is durably constructed of the highest quality material. It will pay in service over a long period of time.



Safety and comfort are the big features in Giant Portable Bleacher construction. Made of the highest quality material and will last indefinitely.

FRED MEDART MANUFACTURING CO.

3550 De Kalb St., St. Louis, Mo.

Manufacturers Since 1873

Steel Lockers, Shelving and Cabinets, Gymnasium and Playground Apparatus

PLAYGROUND EQUIPMENT

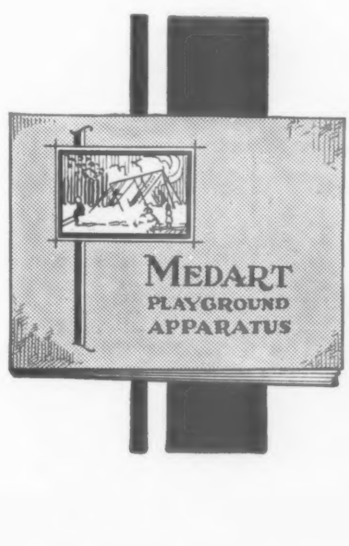
One of the most vital considerations in school equipment is Playground Apparatus. It must be proved safe, be able to withstand rough usage and weather exposure, and provide the greatest pleasure for a large number of children.

Medart Playground Equipment is designed and constructed for Safety, Service, and Durability. The Medart Engineers through years of careful study and experience have evolved the finished product that gives the utmost in those essential factors.

Whether you are planning a playground, or replacing, or adding to your present equipment, Medart is prepared to give valuable aid in the selection of equipment; the service of the Engineering Department is offered without obligation.

THE MEDART CATALOG

The colorful, new Catalog M-5 of Medart Playground Apparatus illustrates and describes the complete line, which includes many new pieces of equipment. This catalog will be sent free upon request.



MILLERSVILLE SUPPLY COMPANY

Manufacturers of

Benches, Swings and Portable Bleachers

MILLERSVILLE, PA.

Trade Name—
"BAUSMAN BETTER BENCHES"

HISTORY

"Bausman Better Benches" and Swings have been manufactured and used for more than a quarter of a century, in which time we have developed a line of the most practical designs and have kept absolute faith with our customers. Our motto has always been, "The customer must be satisfied."

This line comprises nine designs of benches—each one differing from the other in style, but each one tried and found especially serviceable—also the New Heavy Park Swing.

Schools and Universities everywhere are finding benches and swings a means not only of beautifying their campus but also of making the campus more attractive and inviting to the students.

In gymnasiums where a balcony or gallery is present, our benches can be furnished in special lengths and "tailored" to fit, providing long, continuous, comfortable seats which will accommodate a maximum crowd. More schools are finding this a means of providing better and more comfortable seats at a great saving in cost. The seats for each installation are made up from specifications and floor plans, insuring the use of all available space for seating and providing ample room for passage between rows.

CONSTRUCTION

All "Bausman Better Benches" are attractive, comfortable and durable. They are made in three standard lengths—four, five and six feet; also special lengths to order.

All frames are hand-wrought steel. All wood parts are made from selected hard wood, thoroughly air-dried and seasoned.

All metal parts are finished with green enamel, and the wood parts with weatherproof varnish or green enamel, if desired.

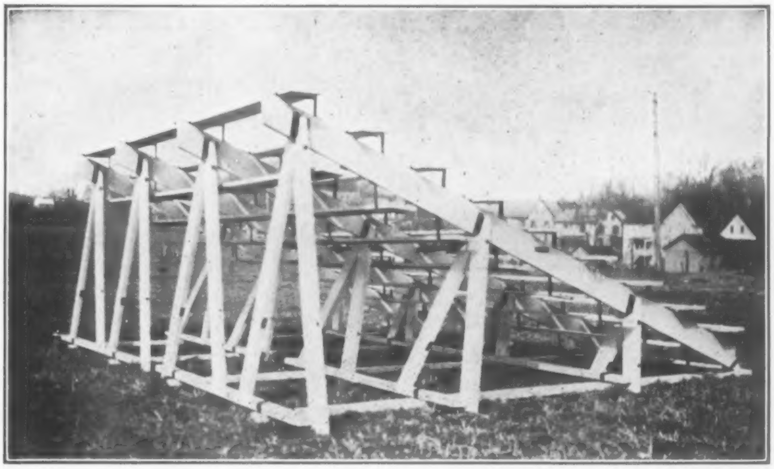
THE "COMMONWEALTH" BENCH

This is but one of our nine designs of benches, but the most popular for use on the campus owing to its comfort. Notice the full-shaped seat and back, insuring comfort to those who use it, whether for studying, reading or relaxing.

THE "COMMONWEALTH" BENCH

THE NEW HEAVY PARK SWING

This swing has become very popular and, owing to its heavy construction, is a very practical piece of equipment giving many years of service. The frame is made of 1½" x 1½" x 3/16" steel angles and the whole swing, weighing 250 pounds, is shipped in three parts which are very easy to assemble.



Note the strong braces and the unique manner in which each section is put together. Parts may be stored in a comparatively small space.

PORTABLE BLEACHERS

This is a comparatively new item which has been added to our line only after several years of experimenting to prove that we were able to offer the most practical form of seating arrangement for indoor and outdoor use.

The bleachers can be erected and torn down by the most inexperienced persons for there are no screws nor bolts to be used and each part fits in its place. They can be moved to any place where a crowd must be accommodated—indoors or outside—and when it is desired to store them away, they can be placed in a comparatively small space.

In addition to all this, they provide the greatest comfort to the spectators in the minimum space. The pitch of the seats gives every spectator a clear view and the footroom underneath the seat ahead avoids soiling the clothes of the persons seated in front.

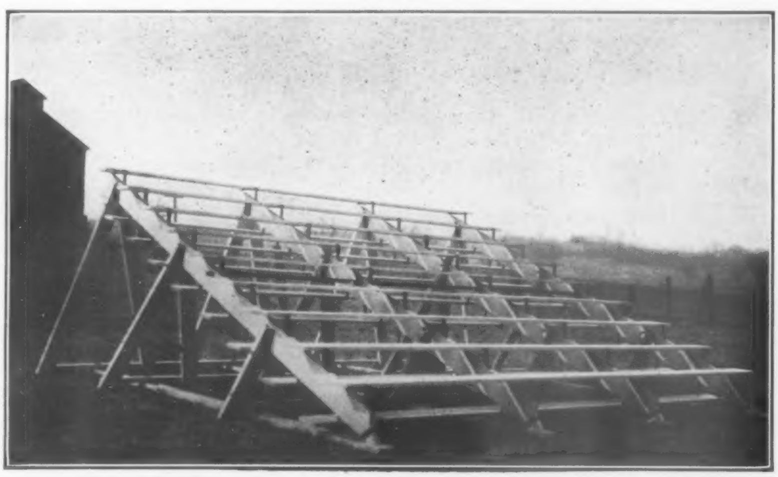
They are safe—every feature in the construction of our bleachers is designed for safety. We use only fir for making the wood parts—insuring the greatest strength and the longest life—and all metal parts are hand-wrought steel.

They are furnished in sections of from two tiers to ten tiers in height, each tier seating ten to eleven persons. Each section is sixteen feet long, but where sections adjoin to make a continuous stretch of seats, each additional section after the first adds fifteen feet on account of overlapping of boards.

All wood parts are painted grey, and all metal parts black.

COMMUNICATIONS

All communications should be addressed to our office at Millersville, Pa.



Any person can assemble these bleachers in no time at all. Each part easily fitted in place. No bolts, screws or nuts are used.

NARRAGANSETT MACHINE COMPANY

Manufacturers of

GYMNASIUM APPARATUS, STEEL LOCKERS, SHELVING,
STORAGE CABINETS, PLAYGROUND APPARATUS

General Office and Works:
Pawtucket, R. I.

Mailing Address:
P. O. Box 1454, Providence, R. I.

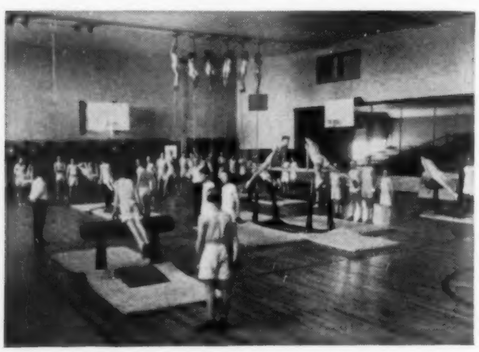
Branch Offices:

New York, 214 East 40th Street

Chicago, 1504 Monadnock Block

Gymnasium Apparatus

For more than 45 years Narragansett Gymnasium Apparatus has faithfully served Physical Education in schools, colleges, and institutions. What probably is the largest reserve gymnasium apparatus stock in the country is maintained in the store room to supply your requirements. Much of the equipment must be made special to fit your particular gymnasium. Our policy has always been to serve the institution direct, thus giving factory service where the various engineering details are involved. Our engineering department will gladly make recommendations as to the best type of apparatus for your definite problems.



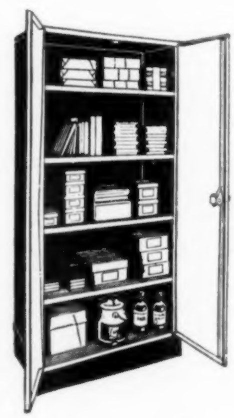
Gymnasium Catalog F

The Narragansett Gymnasium Catalog fully illustrated is used as a standard for specifications. Bound in the latter half of the catalog is our Manual of Gymnasium Construction. This is also furnished in monograph form for architects and building committees. Full detailed information is given regarding the gymnasium building, particularly the preparation of walls and ceiling for attached apparatus.

Anthropometric Apparatus

We manufacture anthropometric apparatus that is used by physicians and physical directors for ascertaining the physical measurements of the individuals. A large stock is kept on hand for prompt shipment.

Steel Storage Cabinets



High Grade Steel Storage Cabinets for office supplies, books, tools, paints, records, etc. Wardrobes and janitor's equipment can be furnished in various sizes from stock. You have a use for these sturdy, economical cabinets. Attractive factory prices are given in the Cabinet Folder.

Steel Shelving and Lockers

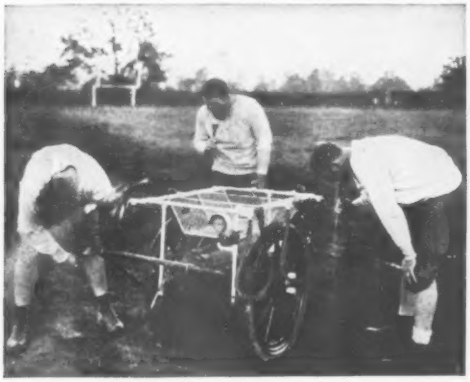
For offices, stock rooms, laundries, sewing rooms, and check rooms Narragansett Adjustable Steel shelving is economical, fire-resisting, and durable. Estimates are furnished. Ask for Shelving Folder.

As one of the pioneers in steel locker manufacture, the Narragansett Standard Lockers have given satisfaction as to service, attractiveness, and durability. They are made in a variety of sizes and combinations. Prompt shipment is made from stock. Full information is given in Catalog G.

Playground Apparatus

Narragansett Playground Apparatus is designed for safety, sturdiness, and long life. Swings, seesaws, slides, giant strides, etc., are shown in the Playground Catalog D.

The Narragansett Water Wagon

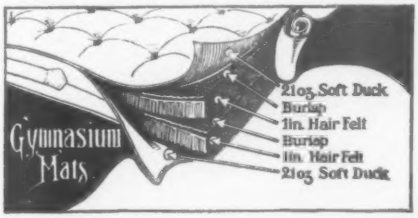


A self-contained sanitary multiple drinking fountain and pressure spray that receives the enthusiastic endorsement of such institutions as West Point, Stanford University and others. Introduces a new era in athletic hygiene. Sturdily constructed and built to last many seasons. A large supply tank with tray for icing. Eight separate connections of flexible hose are topped by faucets controlled by spring valves. Pressure is regulated by hand and furnishes a gentle trickle or powerful spray. Of inestimable value as a "freshener" just when it's needed. A strong wire basket at top provides ample space for towels, trainers' or physicians' first aid kit. A strong hand pump keeps pressure at desired intensity between periods of use. Entire machine is mounted upon a heavy axle. Wheels are pneumatic-tired. **Write for literature.**

Narragansett Portable Bleachers

A distinct step forward in simplicity without sacrificing strength. Few parts make for ease of erection. No loose nuts, bolts or screws. No small parts to be lost and no tools necessary for erection. Requires a minimum of space for storage. Thoroughly tested and possesses a factor of safety far beyond ordinary needs. Supplied in three, four, five, six, seven or eight tiers. All wood is smooth-planed and nicely painted. This is the type of equipment for all occasions—football, basketball, baseball, gym meets, swimming meets, tennis matches, track meets, etc. One or two events will often pay the entire cost. **Send detailed literature.**

Narragansett Gym Mats



A close study of the accompanying illustration will reveal the secret of the overwhelming popularity of Narragansett Gymnasium Mats. Here is an item of equipment that merits keen judgment in purchasing. Its vital importance not only in use but in "long wearability" demands quality materials and workmanship throughout. Narragansett Gymnasium Mats were built first and priced afterwards. Many have been in use for more than 20 years. They afford a maximum of protection. They will hardly show the first signs of wear when cheaper substitutes have long been discarded. Their cost will be far less when long service is considered. **Send for literature.**

ROBERTS FILTER MANUFACTURING CO.

607 Columbia Avenue

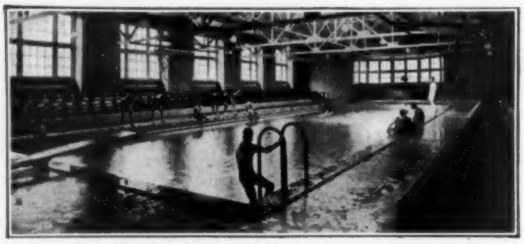
Darby, Pa.

Swimming Pool Sanitation

Recirculation has completely solved the question of swimming pool sanitation. It is mandatory under State Board of Health regulations in many states. With recirculation the water is drawn from the deep end of the pool by a centrifugal pump and returned through filters and sterilizing equipment and in the case of indoor pools, through a heater to the shallow end of the pool.

Catalog

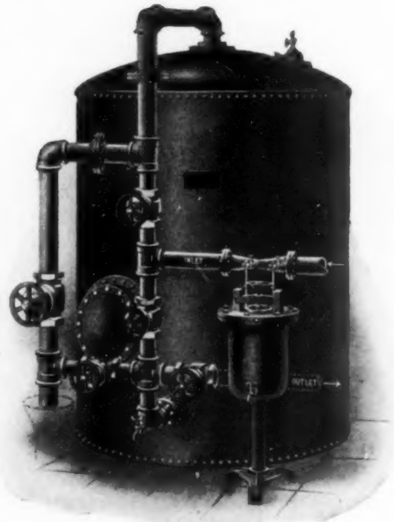
Our new Swimming Pool Catalog, copy of which will be mailed on request, contains a typical arrangement of pressure filters in conjunction with a recirculating system for indoor pools.



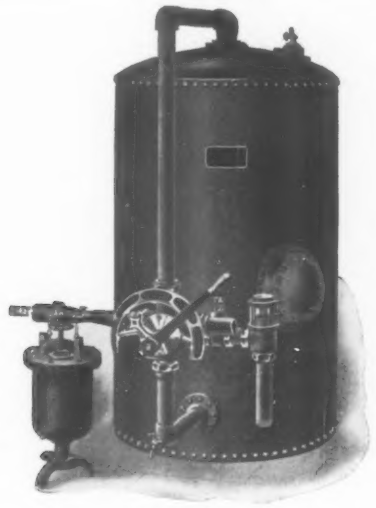
McCLAIN VOCATIONAL SCHOOL
GREENFIELD, OHIO

Design

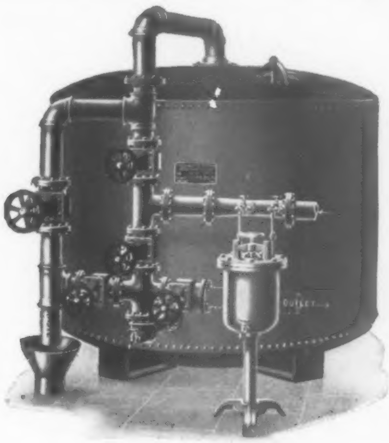
Where the bathing load is normal, the recirculating plant for pools of not more than 100,000 gallons capacity should be designed to recirculate the entire capacity of the pool in 8 hours. For pools containing greater capacity, a recirculating period of 12 hours can be employed. The rate of filtration should preferably be 3 gallons per square foot of filtering area per minute but in no case should it exceed 4 gallons per minute per square foot. Over 400 swimming pools all over the country are now employing Roberts Filters with distinct success.



STYLE "H"



STYLE "G"



STYLE "L"

Cooperation

Our Engineering Department is at the service of Architects and Engineers engaged in the design, construction or maintenance of swimming pools. We welcome every opportunity of cooperation. Our new Swimming Pool Catalog mentioned before contains complete data on the sanitation of swimming pools.

Equipment

All filters are fully equipped and before shipment are assembled and carefully tested. With each installation we include an automatic coagulant device.

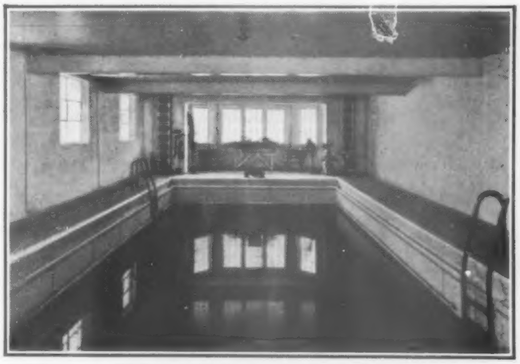
Cleaning of Roberts Filters is thoroughly and easily accomplished by reversing the flow of water, which lifts and "liquefies" the sand bed, scouring it on itself and flushing the accumulated suspended matter and impurities to the sewer.

Specifications

Specification data on all types of Roberts Filters in bulletin form will be sent on application. Our styles "H," "G," "L" and horizontal pressure filters are recommended for swimming pool recirculation.

Accessories

We manufacture pool fittings, haircatchers and other accessories which will be supplied separate from filters and other recirculating equipment when specified or so ordered.



ALMA COLLEGE, ST. THOMAS, ONTARIO, CANADA

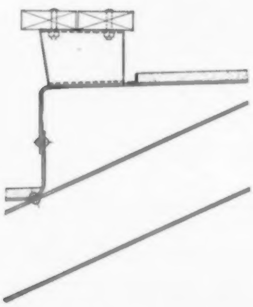
VIRGINIA BRIDGE & IRON CO.

General Offices: Roanoke, Va.

STEEL STADIA

Designers and Manufacturers of Steel Stadia, Grandstands, and Steel Structures of all Kinds and Sizes

ROANOKE, VA.—BIRMINGHAM, ALA.—MEMPHIS, TENN.—ATLANTA, GA.—DALLAS, TEXAS
NEW YORK, N. Y.—NEW ORLEANS, LA.—CHARLOTTE, N. C.—EL PASO, TEXAS—LOS ANGELES, CALIF.



Detail of Seats and Steel Deck of Stadium

Front View, Woodlawn High School Stadium, Birmingham, Alabama

SEATS OF LEARNING

A Steel Stadium, good to look at and good to look from, comfortable seats, well spaced and pitched, a finished and groomed appearance generally.

The deck of this stadium is built of steel plates, bent, lapped, riveted and welded. The wooden seats are made of two 6-inch widths of 2-inch thick tidewater cypress bolted to steel seat brackets.

The deck rests on a steel frame of beams and columns of known definite strength greatly in excess of maximum load demands.

SAFE AND SECURE

Steel construction competently designed and built is safe and secure, and the steel stadium is likewise safe and secure. It will not collapse. It will not burn. It requires only periodical painting to keep it in a new, permanent condition. Copper bearing steel plates may be used for the deck as added protection from the weather.

Rear View of Woodlawn Stadium Showing Entrance Towers, Class Rooms, Auditorium, etc., on first floor and Armories, Dressing Rooms, etc., on Second Floor

Looking at this picture and the very pleasing architectural make-up, one would hardly think that the roof is the stadium. But why not?

The Steel Deck of the Stadium is made Watertight and that is all a roof needs plus proper wind and snow-load strength

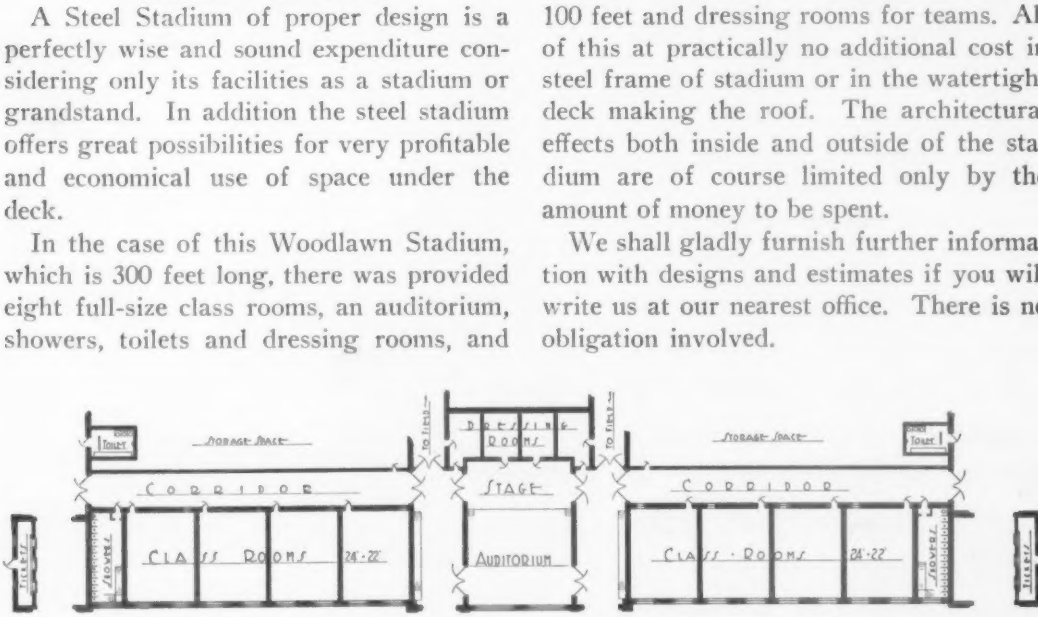
DIAGRAM AT BOTTOM SHOWS ARRANGEMENT OF CLASS ROOMS, ETC.

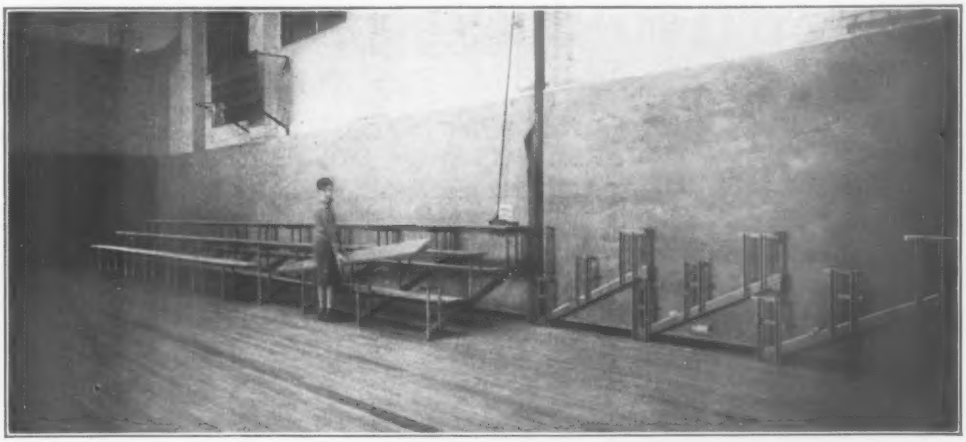
UNDER THE ROOF

A Steel Stadium of proper design is a perfectly wise and sound expenditure considering only its facilities as a stadium or grandstand. In addition the steel stadium offers great possibilities for very profitable and economical use of space under the deck.

In the case of this Woodlawn Stadium, which is 300 feet long, there was provided eight full-size class rooms, an auditorium, showers, toilets and dressing rooms, and on the second floor two armories 11 feet by 100 feet and dressing rooms for teams. All of this at practically no additional cost in steel frame of stadium or in the watertight deck making the roof. The architectural effects both inside and outside of the stadium are of course limited only by the amount of money to be spent.

We shall gladly furnish further information with designs and estimates if you will write us at our nearest office. There is no obligation involved.





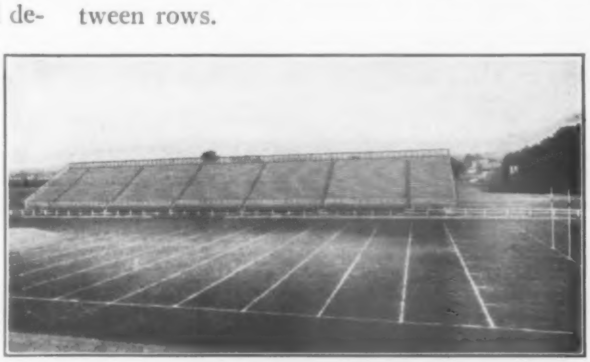
WAYNE "D" TYPE FOLDING WALL STAND. AN IDEAL ARRANGEMENT FOR GYMNASIUMS

hazard reduced to minimum. Endorsed by casualty insurance companies.

The Type "C" Portable Steel Stand is designed for limited areas and is made from three to eight rows high. Additions can always be made to length. Its essential design same as Type "B." Used indoors and outdoors. Especially suitable for gymnasiums, swimming pools, etc.

Type "D" Stand is a specially designed wall stand that meets the needs of many schools. The steel stringers are hinged to the wall and when not in use swing flat.

In all the above type stands the seats and footboards join flush. Seatboards are securely locked to supports and cannot accidentally be removed. Footboards are wide and it is impossible to slip down between rows.

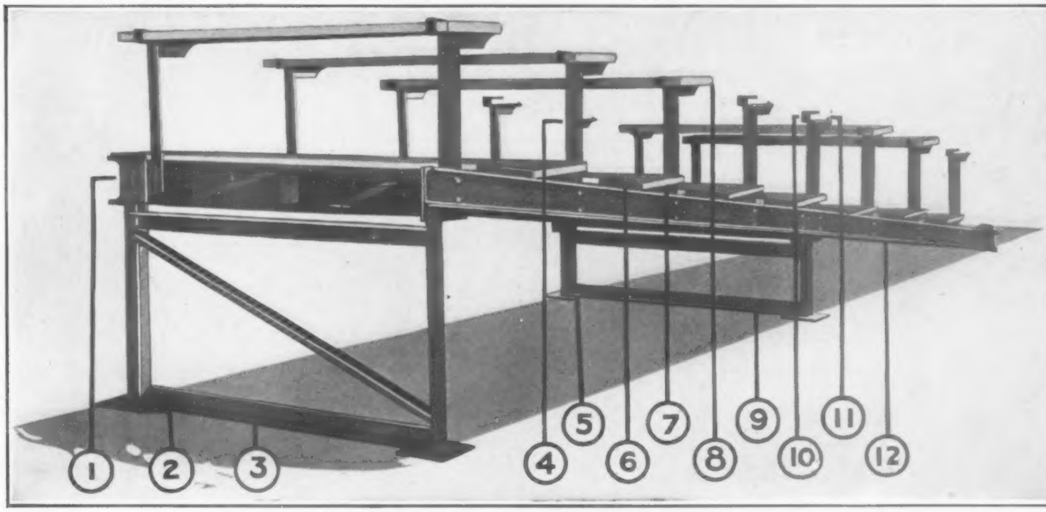


WAYNE PERMANENT STAND, UNIVERSITY OF MARYLAND

WAYNE PERMANENT STEEL STAND REPLACES WOODEN STAND AT PEDDIE SCHOOL

Wayne also makes Permanent Steel Grandstands and the massive stand at the University of Maryland is a striking example of Wayne's engineering skill.

Full information on your seating requirements will be cheerfully supplied on request.



DETAIL OF CONSTRUCTION

The photograph above will give an idea of the construction of the Williams Portable Stadium. Referring to the corresponding numbers above, the following is a description of the stadium parts:

(8) Seat board held in position on

(4) Steel seat carrier riveted to

(12) Main string of structural steel supported by

(3) and (9) Structural steel upright frames connected to main string by

(1) Patented slip joint requiring no bolts to assemble

(10) Spring welded to carrier (4) holding seat boards (8) down.

(11) Fixed steel clip welded to carrier (4) to keep seat board in position.

(7) Footboard.

(6) Filler board (may be omitted on low stadia).

(2) and (5) Steel bearing plates.

A steel shelf angle is welded to the main string (4) upon which footboards rest. Steel slip joints at the end of the wood seats and footboards come to the site fastened on the boards.

AT GEORGE WASHINGTON HIGH SCHOOL, NEW YORK, N. Y.

ARMCO CULVERT MFRS. ASSOCIATION

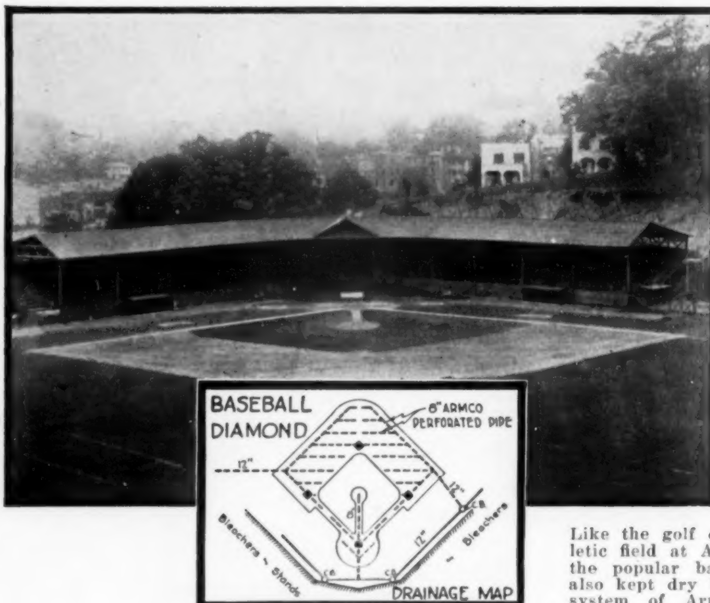
Middletown, Ohio

Manufacturers of

ARMCO PERFORATED IRON PIPE

for

SUB-DRAINAGE OF PLAYGROUNDS



Like the golf course and athletic field at Asheville, N. C., the popular baseball park is also kept dry by its drainage system of Armco Perforated Pipe

Armco Perforated Iron Pipe is in universal favor as an efficient and permanent means of keeping athletic fields and playgrounds well drained.

The pipe is made of Armco Ingot Iron—the purest iron made—which has served successfully in storm sewers, culverts and drains for 24 years. It is highly rust resistant and, being flexible, is unbreakable.

Through the small, closely-spaced holes, in the valley of each corrugation, surface water is removed rapidly. Except during actual storms, games can always be played on schedule.

Still another valuable feature is the adaptability of Armco Perforated Pipe to removal and re-installation in other locations.

Armco engineers, with years of experience in all forms of sub-drainage, are at your service on every Armco drainage project. Send to Drainage Headquarters, Middletown, for playground drainage data and suggestions for the solution of the drainage problem on your specific project.

DETROIT-ATLAS PORTABLE BLEACHER SEAT COMPANY

520 Free Press Bldg.

DETROIT, MICHIGAN

SEATING FOR SPECTATORS IN GYMNASIUMS, ATHLETIC FIELDS, ETC.

In selecting Bleacher Seats, the most important features to be considered are:

Safety, Strength, Durability, Appearance, Comfort, Ease of Handling, Minimum Space in Transporting and Storing, Lowest Average Yearly Cost—No Up-Keep.

The combination of all of the above vital points is exclusive with the DETROIT-ATLAS.

SPECIFICATIONS

Assembly—Each full sixteen-foot section a complete independent unit, supported on FOUR jack-and-stringer assemblies. No overlapping of seat and footboards.

Jacks—2 x 4 long leaf yellow pine, securely bolted through the top and connected NEAR THE BOTTOM by a heavy iron bar bolted through.

Stringers—2 x 8 long leaf yellow pine, to which are attached

Iron Supports for Seat and Foot Boards—being **MALLEABLE CASTINGS** which straddle the stringer, attached by bolts which pass through the stringer and both jaws of the castings.

Steel Locking Device—Consists of 1¼ x 1¼ angle steel thrust rod, to which are riveted malleable hooks, locking all jacks to nose of stringer.

Seat Boards—1¼ x 10 Oregon Fir—without a knot—rounded edges.

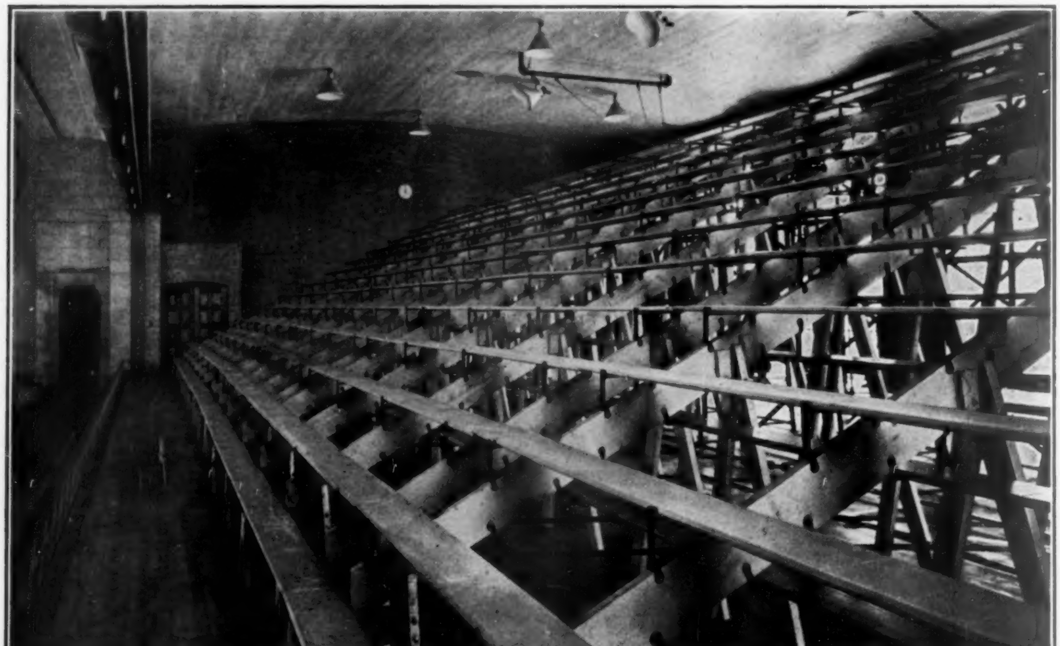
Foot Boards—1¼ x 8 Oregon Fir—without a knot—rounded edges.

Nose Rest—2 x 8 long leaf yellow pine.

Painting—All wood parts painted with best quality gray floor paint. All castings and steel black enamel.

Non-Split Corrugated Steel—Driven into ends of seat and foot boards.

Elevation—Seats spaced 22 inches on stringers with 7½-inch rise; or, 24 inches on stringers with 12-inch rise.



DETROIT-ATLAS SEATS OVERLOOKING THE POOL IN THE WORLD'S MOST BEAUTIFUL INTRAMURAL SPORTS BUILDING, UNIVERSITY OF MICHIGAN

DURABILT STEEL LOCKER CO.

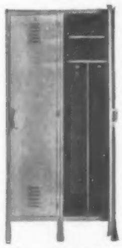
SALES OFFICES
IN PRINCIPAL
CITIES

Manufacturers of
High Grade Lockers, Storage and Wardrobe Cabinets
"Save and Beautify — with Steel"

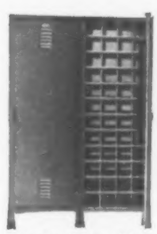
612 Arnold Ave.
AURORA, ILL.

DURABILT STEEL LOCKERS

Two-in-one Lockers

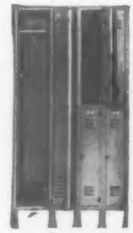


Two Person Lockers



Single Tier Shoe Lockers

Single Tier Lockers with Adjustable Shelves



Gymnasium Lockers

The Durabilt line includes steel lockers of every description as well as steel cabinets in hundreds of sizes with interchangeable and adjustable equipment. Write for literature and prices.

For every need that exists in modern buildings for locker equipment to protect clothing, miscellaneous supplies, etc.—there is a Durabilt Steel Locker to meet the requirement.

These illustrations display a few of the numerous standardized types we are in a position to furnish. We are also prepared to submit sketches on special locker designs (providing the quantity needed would justify it) and to assist in the preparation of your locker plans and specifications.

Our experience as "Locker Specialists" is always at your command to help with your locker problems. Avail yourself of this service which will not obligate you in any respect. Phone our nearest Sales Office or write us direct at Aurora.

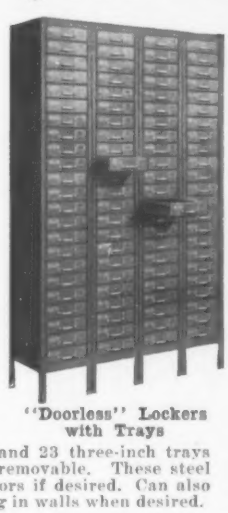
For further information on Durabilt Steel Cabinets for the storage of athletic and sports equipment, **see our advertisement on page 357.** Write for cabinet literature and prices.

"No better built than Durabilt!"

Single Tier Lockers

Durabilt Single Tier Lockers in either single row or double row (back-to-back) arrangement provide service for storing clothing in the most convenient form.

Equipment consists of hat shelf, one double prong ceiling and three or more single prong side hooks, depending on the size of the locker.



"Doorless" Lockers with Trays

Multiple Tier (Box) Lockers

Double Tier Lockers

Durabilt Double Tier Lockers are economical both as to space and cost. They can be used in corridors and locker rooms the same as single tier lockers.

No hat shelf is furnished in Double Tier Lockers. Hook equipment is same as in Single Tier Lockers.

"DOORLESS" LOCKERS WITH TRAYS

(For Art, Sewing, Cooking Classes, etc.)

Equipment consists of 19 three-inch trays in 60" high and 23 three-inch trays in 72" high lockers. Trays are removable. These steel lockers can be furnished with doors if desired. Can also be made without legs for recessing in walls when desired.

Multiple Tier (Box) Lockers admirably fill the need for small storage space for togs, books, lunch boxes, tools, and work materials. Many school authorities prefer them to racks in connection with basket storage because of their security features.

No shelves or hooks are furnished in standard Multiple Tier Lockers.

THE EVERWEAR MANUFACTURING CO.

The World's Oldest and Largest Exclusive Maker of Playground Apparatus

DEPT. 33

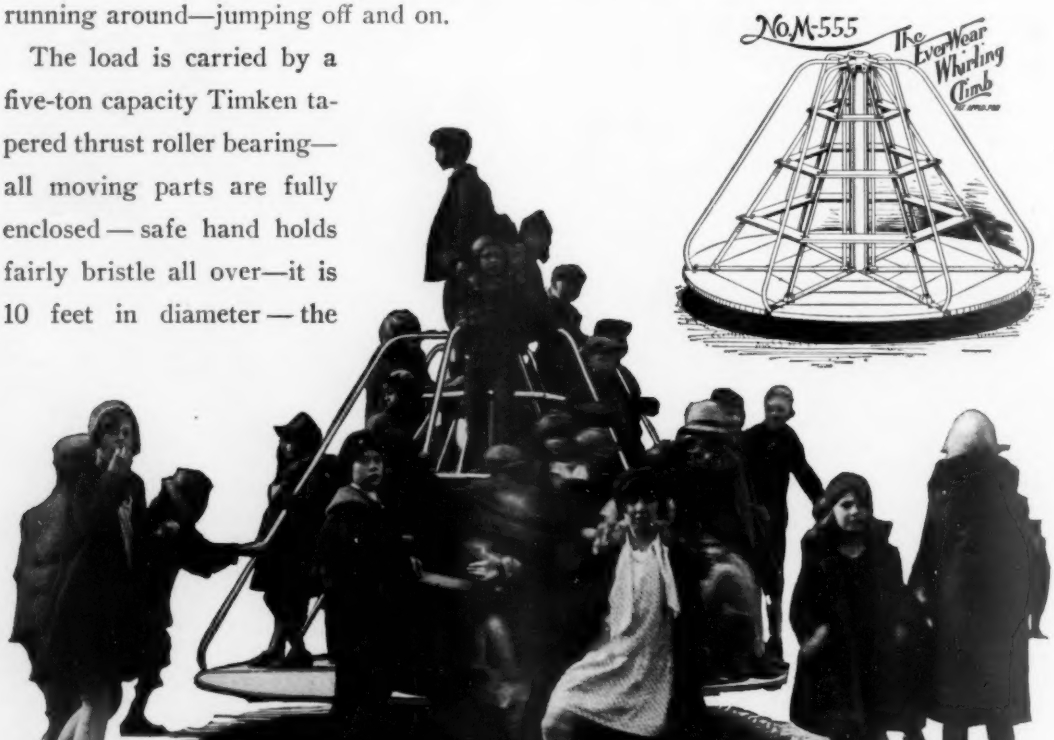
SPRINGFIELD, OHIO

Real fun — healthful exercise — a safe climb—endless travel—games—that briefly describes the splendid function of the Ever-Wear Whirling Climb—No. M-555—(Patent applied for).

Fifty children can use it at the same time—but one child can have a dandy time on it—a handful of children can play tag all over it—climbing up—sliding down—running around—jumping off and on.

The load is carried by a five-ton capacity Timken tapered thrust roller bearing—all moving parts are fully enclosed — safe hand holds fairly bristle all over—it is 10 feet in diameter — the higher the child climbs (6 feet high) the closer he is to the center—which is an important element in the fine safety of this unforgettable outfit. Priced most reasonable for such outstanding value.

All other EverWear Playground Outfits are also known for their safety, durability, beauty and playability, and the EverWear line is very large and most complete. Write for the EverWear Catalog No. 22.



GENERAL ELECTRIC COMPANY

General Office: Schenectady, New York

SALES OFFICES IN PRINCIPAL CITIES

This Light Started Sports at Night

In the fall of 1923, Tufts College played the G-E engineers on the Lynn Athletic Field by the light from G-E Novalux floodlighting projectors —the first football game at night.

Since then, this light, improved year by year, has been popularizing outdoor sports at night. Under it, football, soccer, baseball, tennis, golf and hockey have been played successfully. Colleges, prep schools, high schools and civic bodies have adopted it for their fields.

Last season Union College, at Schenectady, N. Y., found the G-E Type L-31 floodlighting projectors of great value for hockey practice. Since the schedule of classes prevented hockey practice before five o'clock in the afternoon, floodlights were used practically every night. They furnished plenty of light in which to play such a fast game with such a small object as the puck.

Another use of the G-E projectors is for the swimming pool. Of course, the swimming pool does not require the perfect lighting and absence of shadows required by the hockey or football game, and can therefore be lighted very inexpensively.

UNION COLLEGE HOCKEY COURT

What are the advantages of floodlighting? For one, it doubles the gate receipts and often pays for itself the first game. Take, for example, the last annual game between the College of Puget Sound and the University of Washington, Seattle, which drew a crowd of 20,000 as against 10,000 at a daylight game the previous year.

One year, on the Lynn Athletic Field, eight baseball games were played in less than a month and the crowds exceeded the capacity of the field on each occasion. And this year the Des Moines, Iowa, club in the Western League is planning to play every home game at night.

Advantages of G-E Floodlighting

G-E floodlighting is light of just the right intensity—from projectors scientifically designed, properly focused, and spaced to meet the requirements of the field. It is clear and bright—shadowless, glareless—illumination of the utmost uniformity and visibility. In short, it is the perfect light for sports at night.

So when you plan to floodlight your field, have a G-E lighting specialist look it over. He'll give you complete information and recommendations —gladly and without obligation. You can get in touch with him through the nearest G-E sales office.

FOOTBALL FIELD, SHOWING FLOODLIGHT INSTALLATION

GRAVER CORPORATION

Swimming Pool Purification Equipment
Water Softeners—Filters—Steel Tanks

4250 Tod Avenue, EAST CHICAGO, INDIANA

SANITARY SWIMMING POOLS

No modern recreational program is complete without proper swimming facilities. Swimming is a healthful recreation in a sanitary pool.

Any swimming pool can be kept clean and sanitary. It is not just a matter of changing the water at certain intervals and scrubbing the sides and bottom. A properly built sanitary pool may be filled with water at the beginning of the term in September and not emptied until June and always be clean and the water as pure as drinking water.

With the knowledge and the equipment of today it is unnecessary to allow a pool to operate in the dangerous, unhygienic, expensive method of former years.

GRAVER POOL EQUIPMENT

This equipment consists of a complete system of pumps, motors, filters, heater and sterilizer.

The water is taken from the pool forced through the filters, heater, sterilizer and returned to the pool. All dirt is removed from the water, it is heated to a predetermined temperature, and sterilized, killing all bacteria. The capacity of the system varies with the size and popularity of the pool. As a rule the system is designed to handle the entire contents of the pool in 10 to 12 hours. With this system the only water necessary to add to the pool is to replace that which evaporates, is splashed from the pool and carried out by the bathers.

GRAVER FILTERS

The heart of this system is proper filtration. Graver filters have been used with universal success with all kinds of water for many years. One big reason for their success is the strainer plate method of supporting the filter bed which does away with clogging and inactivating certain areas in the filter bed. This strainer plate also secures thorough distribution of the backwash water.

GRAVER SERVICE

Our experience covers many pools, operating in every possible manner. Nearly every pool has some "out-of-the-ordinary" circumstance. We feel we can help you, especially so in these cases and will appreciate you bringing your problems to us.

We know that our Bulletin No. 500, "The Water Supply for Swimming Pools," will interest you. Write for it.

GRAVER WATER SOFTENERS

In cases where you have a hard water, a Graver Water Softener will give definite tangible savings in your power plant. Write for particulars.

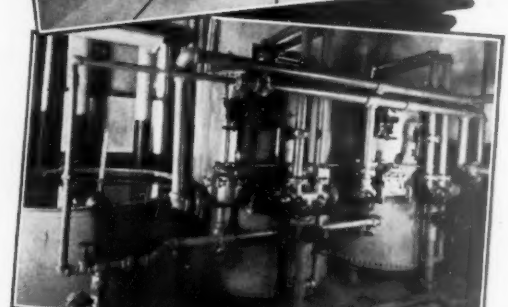
POOL AND GRAVER EQUIPMENT, OHIO UNIVERSITY, ATHENS, OHIO

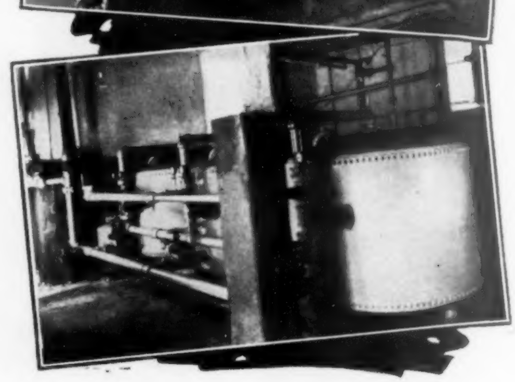
INTERNATIONAL FILTER CO.

Water Softeners — Filters — Water Purification Equipment
Of Every Type and Size — For Every Need and Purpose

333 W. 25th Place, Chicago, Illinois

Sales Offices in Principal Cities





Pool Equipment

International Recirculation and Refiltration Equipment includes filters, sterilizer, pumps, heater, hair and lint catcher, rate-of-flow indicators, pool cleaner, pool fittings, etc., selected to meet the particular conditions of each installation.

International Filters

There are thousands of International Filters in service supplying clean, clear water for the general supply, drinking water, swimming pool, etc. Made in all types and sizes, capacities from 100 gallons per hour to millions of gallons per day.

International Softeners

Soft water for the boiler plant, laundry, hot water lines or entire general supply, will effect savings that soon pay for an International Softening Plant. There is a type of International Softener to best meet your operating conditions.

Co-operative Service

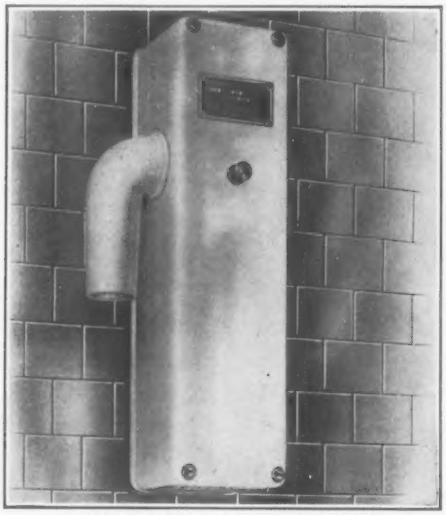
International Filter Co. specializes on complete water purification plants. A large laboratory and engineering staff is maintained to make reports and recommendations. This service is intended to co-operate and not conflict with the work of any representative or engineer of the prospective purchaser. You are invited to submit your problems.

H. W. KEEBLER MANUFACTURING CO.

422 First Avenue, Pittsburgh, Pa.

Products

KEEBLER Hand-Operated and Automatic Electric Warm Air Hand, Face and Hair Dryers.



SINGLE WALL OUTLET MODEL

Modern application of electricity for drying the hair, hands and face, has now been accepted and is fast proving its worth in the modernization methods now being adopted in old and new swimming pools, schools, hotels and other private or public institutions.

Advanced sanitation for the protection of public health and welfare, coupled with greater effectiveness, efficiency and reduced operating costs, placed the electric warm air dryers in a well deserved position in the public mind.

The elimination of the paper and linen towel, always expensive and in a great many cases, of a questionable sanitary standard, in public institutions, has more than anything else aroused and won public approval of the new and sanitary electric way.

Keebler Dryers

In keeping with the advancement in electric drying methods, Keebler Dryers represent the most advanced equipment to meet all requirements and installations.

Types

The Wall Model—Used mostly in the modernization of present buildings.

Built-In Wall Model—The most popular type for new buildings or pools.

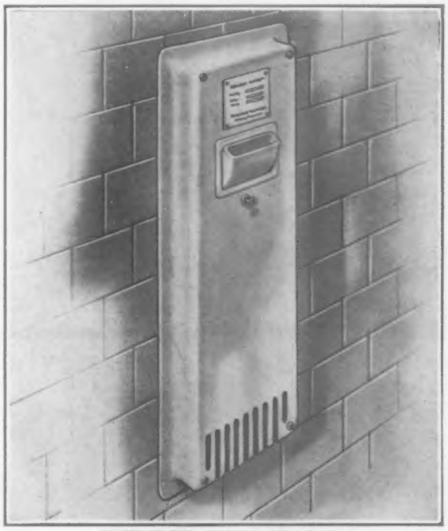
Pedestal Models—This type is available in either one, two or four outlet models and is best adapted to present buildings or where insufficient wall space is available.

All models can be equipped with either push button automatic time switches for face or hand drying or standard start and stop switches for hair drying.

Construction

The enclosing case, base, adjustable nozzle and pedestal are made of highest grade grey cast iron heavily porcelain enameled in any desired color.

The motor, fan, heating element and all connections are especially designed and tested for the service and are of the highest grade obtainable.



BUILT-IN WALL MODEL

Sixty Keebler Dryers are now installed in the Public Schools of Pittsburgh, Pa., for the student swimming pools.

Keebler Dryers and Service guarantee satisfaction.

We invite architects, engineers, school boards and building owners to bring their drying problems to us. Our experience and data, we know, will be of interest.

MITCHELL MANUFACTURING COMPANY

Manufacturers of

"Betterbilt" Playground Apparatus

1401—29th Avenue, Milwaukee, Wis.

Branch Office and Warehouse, Wichita, Kan.

CITY PLAYGROUND (WEST ALLIS), MILWAUKEE, WISCONSIN

Products

We manufacture a complete line of Playground Apparatus consisting of Mitchell-Whirls, Junior Whirls, Swing-Bobs, Swing-a-rounds, Junior Swing-a-rounds, Combination Outfits, Standard Swing Sets, Slide, Water Slides, Turning Bars, Jumping Standards, Horizontal Ladders, Juvenile Swings, Park Benches, Pedo Swings, Flag Poles and See-Saws.

Construction

All material manufactured by us is of first grade. Castings used on all of our equipment are Certified Malleable Iron. The bearings used on the Mitchell-Whirls, Junior Whirls, Combination Outfits and Standard Swing Sets are of the Case Hardened type. The swing seats are select maple and the platform of the Whirl is select pine.

Service

We maintain a drafting department which closely cooperates with city and township officials, assisting them in handling their Playground Problems most satisfactorily and economically.

Representation

Sales Representatives are located throughout the United States and in most foreign countries, and we endeavor to give prospects our personal attention.

Catalog

A beautiful colored catalog is sent free to those interested in securing playground equipment. Send for your copy now.

Mitchell-Whirl No. 500

The MITCHELL-WHIRL is very rapidly becoming the most popular piece of Playground Apparatus on the market. It is especially desirable because of its element of safety and moreover its exceptional facilities for the producing of healthful and invigorating exercise to the children. It is strongly built, very attractive and is designed so as to consume only a very small area of space.

One of its main features is that it has a capacity of fifty children which makes it the least expensive piece of Playground Apparatus per child that could possibly be placed on any playground. Because of its indestructible bearing members, the Merry-Whirl can be easily operated by a single child. The seat remains, at all times, parallel to the ground, and eliminates the dip motion.

MITCHELL-WHIRL "Patented"

PITTSBURGH-DES MOINES STEEL COMPANY

53 Neville Island
Pittsburgh, Pa.

657 Hudson Terminal Bldg.
New York City

955 Tuttle St.
Des Moines, Ia.

3169 L. C. Smith Bldg.
Seattle, Wash.

1263 First National Bank Bldg.
Chicago, Ill.

367 Rialto Bldg.
San Francisco, Calif.

Builders and Fabricators of the
Pittsburgh-Des Moines
ALL-STEEL GRANDSTAND

Description

The Pittsburgh-Des Moines all-steel grandstand is so designed and built that it is directly adapted to athletic fields of universities, colleges and schools. This stand provides a maximum seating capacity for any available area at a minimum cost. It is an absolutely permanent structure and cannot possibly collapse. Steel will not burn, or deteriorate under the action of frost.

Construction

This steel stand is constructed of heavy interlocking steel plates formed into steps. All loads coming on these steps are carried to the ground by steel beam stringers and structural steel columns. The seats, which are of wood, are raised several inches off the steel steps and take no part in carrying the loads of the stand.

Features

This steel grandstand has many advantages and outstanding features.

If desired, it can be architecturally treated with little cost by building an outside wall of brick, concrete, or expanded metal with stucco around the two ends and back.

Upkeep is very small as an occasional coat of paint is all that is required.

The seams of the steel plates are water tight and dressing rooms, etc., can be easily and inexpensively built under the stand.

The investment value of the steel grandstand is high as it it can be taken down and relocated anywhere.

The seating capacity can be easily and inexpensively increased by extending the stands at the ends or back or by building an upper deck.

This steel grandstand can be furnished and ready for use within a remarkably short time.

Deferred Payment

This new grandstand will earn its own cost through our deferred payment plan.

Write for further information. It will be gladly furnished free of any obligation.

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured
by The Solvay Process Company

40 Rector Street, New York

The clean way to PREVENT DUST

on Drives, Tennis Courts, Playgrounds and Recreation Fields

Prevent the formation of germ-laden dust on gravel and dirt-surfaces by applying SOLVAY Calcium Chloride. This clean, white, odorless material makes and keeps playing surfaces smooth, moist, dustless and weedless. Does not track or stain.

It costs little, is easily applied and produces an ideal playing or riding surface. Stocks of SOLVAY Calcium Chloride are available at one hundred conveniently located stock points, assuring prompt delivery with minimum transportation charges. Write for prices and booklet 15557.

(Above) The cinder driveways of the University of Illinois are kept dustless with Solvay Calcium Chloride

(Circle) No dust on this Solvay-treated playground in Detroit

SOLVAY

TRADE MARK REG. U. S. PAT OFF

Calcium Chloride

Flake 77%-80%

At Friendship House, Washington, D. C., this playground is kept dustless with Solvay Calcium Chloride

Championship matches were played on the Solvay-treated courts of the Woodstock Club, Indianapolis

SWIMMING POOL CONSTRUCTION CORP.

Swimming Pool Engineers and Builders
of Indoor and Outdoor Swimming Pools

230 Park Ave., New York Central Bldg., New York, N. Y.

Products and Services

Design, Construction and Equipment of Indoor and Outdoor Swimming Pools, Wading Pools and Natatoriums.

Designing the Modern Pool

The rapid growth of the popularity of swimming pools during the last few years has been accompanied by a greater demand for convenience and for sanitary equipment. New systems of filtering, sterilizing, heating and recirculating the water have been developed. The problem of sanitary maintenance has produced changes in the design of the pool itself, while at the same time more attention is being paid to the decorative treatment of the surroundings. As a result of these developments, the work of planning, specifying and building an up-to-date pool has become increasingly complex.

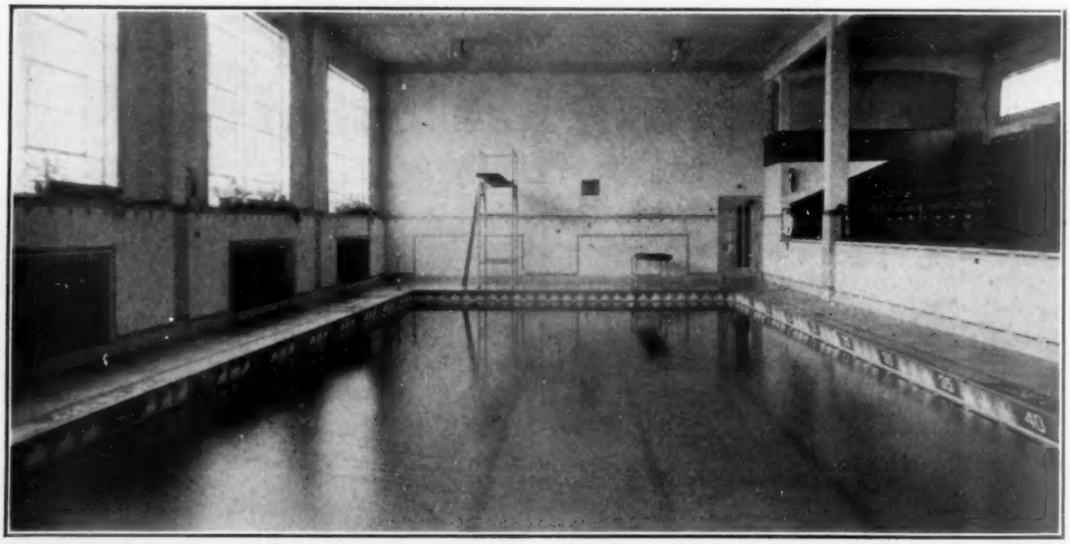
It has been found that the best solution from the architect's point of view is to consult with an experienced firm of swimming pool engineers. In this way the architect can hold down construction costs, avoid excessive demands on his own time, and insure the construction of a satisfactory, permanent swimming pool.

Our Swimming Pool Service

We are a firm of swimming pool engineers and builders. As engineers, we design indoor and outdoor swimming pools, wading pools and natatoriums. We furnish all of the necessary drawings and perform the engineering work for the reinforced concrete and waterproofing. We also lay out all plumbing and mechanical equipment and we write specifications for everything connected with the pool.

As builders, we undertake contracts for swimming pool work complete, or for any portion, such as the reinforced concrete, tile, waterproofing, mechanical equipment and accessories. If the contract is awarded to us we make no charge for our engineering work. However, if the contract is awarded to others we charge a regular engineering fee for services.

To obtain the best results the swimming pool should be treated as a unit when apportioning contracts. That is, the entire swimming pool work, including the reinforced concrete, waterproofing, tiling, mechanical equipment and accessories, should be let as a single contract. In this way responsibility for successful results rests on one organization. Preferably the swimming pool contract should be under the direct supervision of the Architect and Owner.



Section VI

CLASSROOM, OFFICE, LIBRARY AND AUDITORIUM

Plans and Equipment for Nursery, Kindergarten and Primary Education

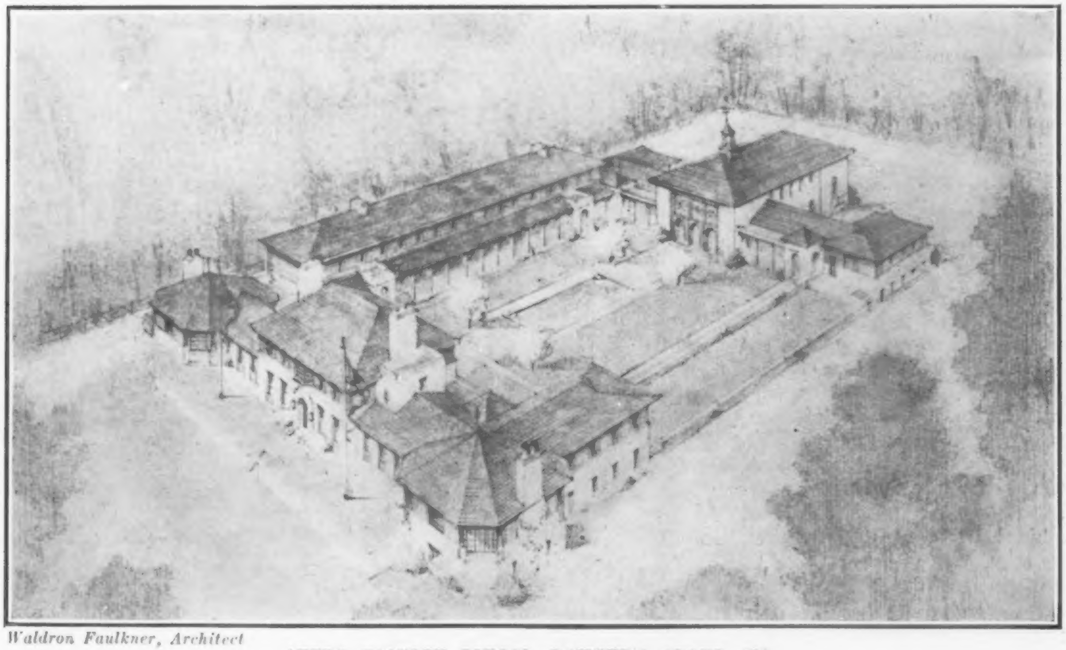
BY MARY DABNEY DAVIS

SPECIALIST IN NURSERY-KINDERGARTEN-PRIMARY EDUCATION
U. S. OFFICE OF EDUCATION, WASHINGTON, D. C.

EDUCATION is concerned with all phases of child development. The well-informed school administrator of today is beginning to realize the significance of the term "education is complete development." Evidences of his changing views are noted in the designs of school buildings and the selection and placement of school equipment. Such needs as physical development and growth, social adjustment, right habits of personal hygiene and attitudes toward life are receiving equal consideration with education's former primary concern of intellectual development and factual accumulation. Opportunities for such development are necessary for all ages of children.

Environment plays an important rôle in education. Instances of increase and deterioration in amount of expressed intelligence, measured by the Binet scales, are being attributed by research workers directly to the richness or poverty of environment. The physical environment provided for children aids or thwarts each or all phases of growth. Psychologists have shown that learning takes place more easily and more permanently when children are happy and purposefully occupied.

The teacher who is responsible for planning the program which keeps children happy and educatively occupied can work to better advan-



Waldron Faulkner, Architect

AVERY COONLEY SCHOOL, DOWNER'S GROVE, ILL.

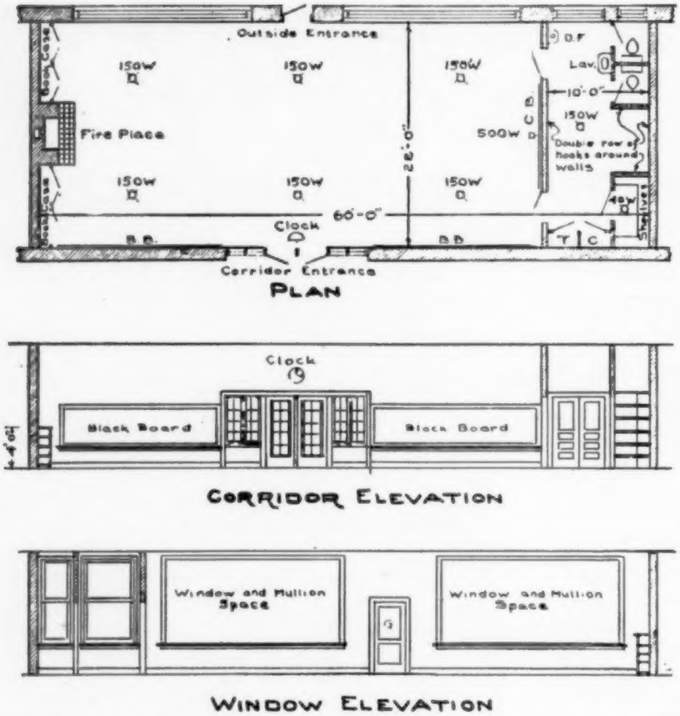
A plan for an elementary school which provides maximum sunlight, outside exits for each classroom, and outdoor play shelter. There is no suggestion of an institution about the building, and the grounds afford every opportunity for the care of animals and the building of gardens

tage in a schoolroom planned and equipped to meet the needs of modern curricula. The young child needs direct sunlight and fresh air. He needs both a stimulus for physical exercise and an outlet for it. This requires an equipment of play apparatus both outdoor and indoors that is adapted to the child's stage of development.

Opportunities to make social adjustments are increased by movable and adjustable equipment. Such equipment encourages social cooperation and helps children to assume individual responsibility for the care and arrangement of the classroom. It also sets up social situations similar to those in all social life. Chairs must be moved to make way for some one or to provide for group work. It becomes necessary to establish amicably the ownership of chairs, of places at tables, of materials, and of storage space. Responsibilities must be shared. The care of pets, plants, bulletin boards, and supply cupboards initiates children into the need for forethought and regularity. Habits of personal hygiene are essential for the child's welfare. With the many activities of the school program, running water, so placed that it can be easily and quickly reached, is an essential. The whole environment, so set up, encourages a problem-solving type of thinking. This type of thinking is essential for the school activities concerned especially with intellectual skill and information.

The alert superintendent of schools has become aware of these objectives of modern education and guides his school architect and constructs his list of equipment accordingly. His school buildings are inviting. Bay windows are added which break the severity of the building's outline, and which provide group rooms or alcoves to supplement schoolroom space. Gardens and shrubbery create a beautiful approach to the building. Well-plotted and well-equipped playgrounds suggest the activities pervading the school program.

This program which the superintendent is offering is known as an "activity curriculum," as "teaching through the social studies" or



DESIRABLE FEATURES OF THIS FLOOR PLAN FOR A KINDERGARTEN ROOM IN DENVER, COLO., ARE THE LARGE FLOOR AND WINDOW AREA, FIREPLACE, OUTSIDE EXIT AND LAVATORIES

Alfred S. Alschuler, Inc., Architects

MAIN FLOOR PLAN, WINNETKA NURSERY SCHOOL, WINNETKA, ILL.
A demonstration and research unit for preschool children in a public school system. Note the provision for two ages of children; also the raised platform in the bay window and the cement walks laid outside for the use of wheel toys

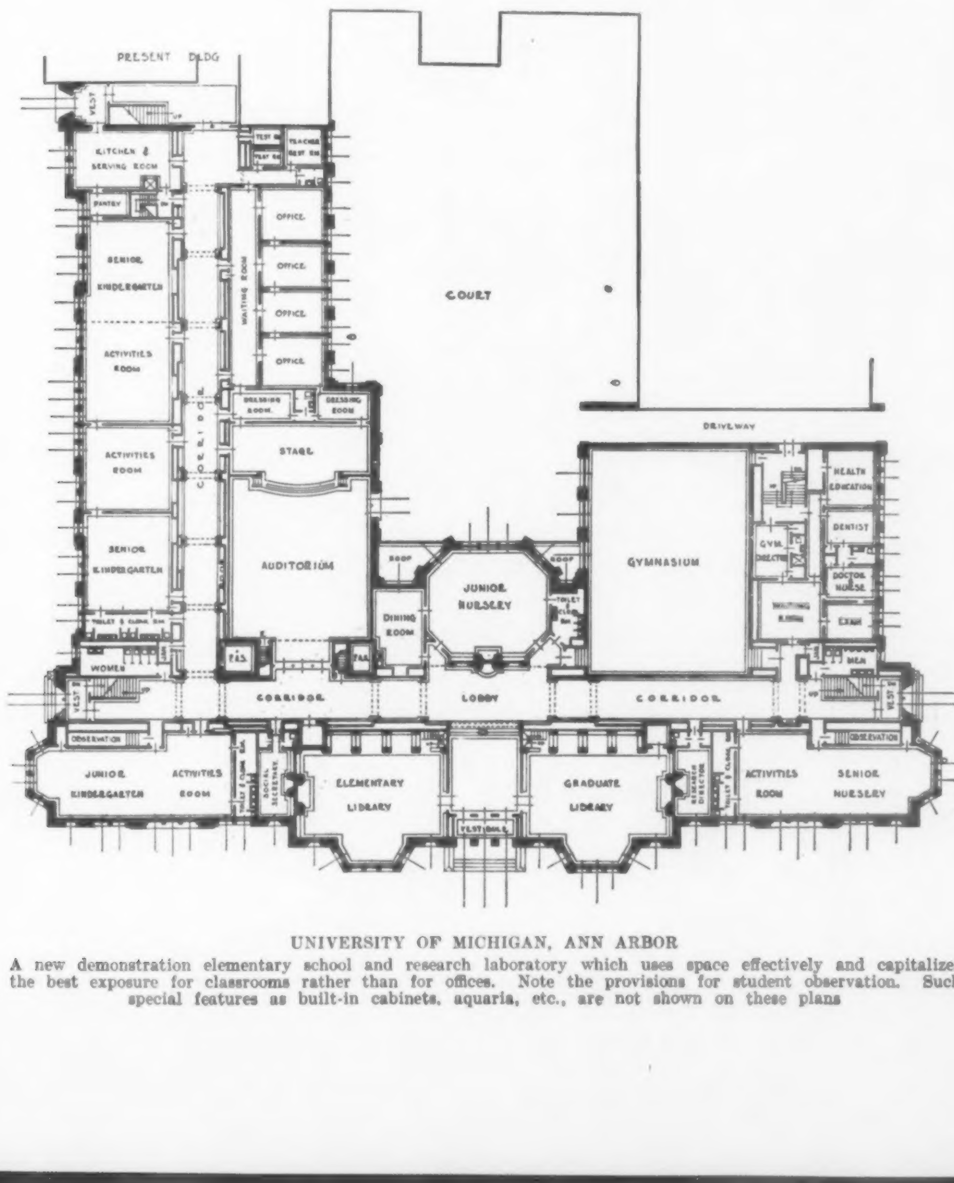
as "child-centered." Whatever name is applied to it, a responsibility reverts to the school administrator to provide the children with a room for work and play which will furnish a setting and a modus operandi for all types of adequate development. Even the well-informed school administrator who knows the details of building schools and of ordering equipment may profit from a discussion which relates these more static factors of environment to the modern educational program.

This discussion is concerned with (1) the amount of floor space allotted to the classrooms for young children and to the outside exposure; (2) the anticipation and provision for many types of equipment during the construction of the building; (3) furniture and other permanent equipment; (4) physical apparatus adapted for play in the classroom and outdoors.

The administrator realizes that the physical set-up is but a part of the child's educational environment. One of our outstanding mental hygienists states that persons in the child's environment effect the greatest influence upon his development. Guidance supplied by the teacher determines the proper use of the physical environment of the school and should be a most potent factor in the child's maximum growth and development.

Floor Space and Window Exposure

The 20 square feet of floor space per child which has, in the past, been accepted as a standard, is inadequate. Learning develops through activities. More space is needed for a group of children moving from activity to activity in a room equipped with a climbing rope and other physical apparatus, with chairs and tables, with work benches, and easels needed for creative and constructive work. Worcester, Mass., is providing 900 square feet in a kindergarten classroom for an enrolment of 30



UNIVERSITY OF MICHIGAN, ANN ARBOR

A new demonstration elementary school and research laboratory which uses space effectively and capitalizes the best exposure for classrooms rather than for offices. Note the provisions for student observation. Such special features as built-in cabinets, aquaria, etc., are not shown on these plans

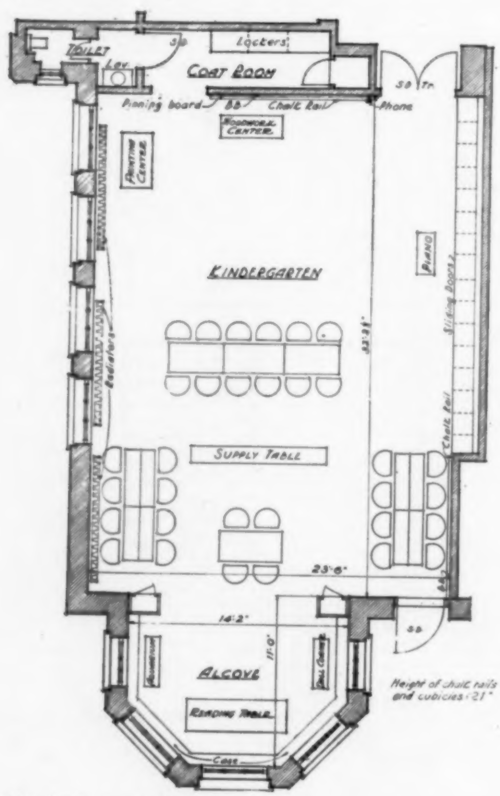
WASHINGTON CHILD RESEARCH CENTER, WASHINGTON, D. C.
A residence adapted for the use of a nursery school. Note the open supply shelves and indoor climbing apparatus

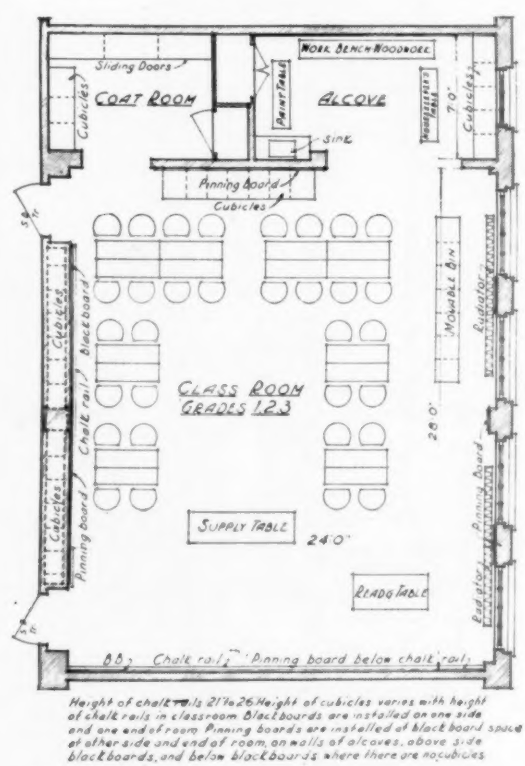
children,[1] and San Francisco[2] provides approximately 850 square feet in the primary grades for enrolments of 32 children. In many cities each schoolroom has an adjoining workroom or alcoves in which certain types of noisy activities or those requiring quantities of materials and storage of partially completed projects may be cared for properly.

A discussion of "space" is incomplete without expressing the need for outdoor playgrounds. At least 100 square feet of playground space per child should be provided. The possibilities of outdoor educational activities have hardly been touched in this country. Nursery schools are helping to make this idea practicable, and in measuring space provided per nursery school child, playground area is frequently reckoned with the playroom floor area. Playgrounds should be well-drained and so exposed as to have adequate circulation of air and plenty of sunshine. Special space should be assigned to the younger children, protecting them from the physical strength and the greater initiative of older chil-

[1] The Eightieth Annual Report, Public Schools, Worcester, Mass., 1928. p. 926.

[2] Furnishing the Setting for an Activity Program in Kindergarten-Primary Grades. San Francisco, Calif, Public Schools. April, 1927.





John Reid, Jr., Architect

A KINDERGARTEN, SAN FRANCISCO PUBLIC SCHOOLS

John Reid, Jr., Architect

A PRIMARY CLASSROOM, SAN FRANCISCO PUBLIC SCHOOLS

Two plans which provide adequate floor area and alcoves for the children's group work. Note the placement of the children's cubicles, and the provision for display space

dren.[3] Terraces and shelters are being provided for outdoor play in inclement weather.

Southern, southeastern and southwestern exposures are essential for classrooms and play spaces assigned to young children. Direct sunlight is needed by the children themselves, and the higher ones, and also permit the children to look outside. Wide window-sills or window-seats invite the children to play in the sunshine and encourage social grouping. Sunlight greatly helps to establish a wholesome, happy atmosphere in the classroom.

THE PLAYGROUND FOR YOUNGER CHILDREN, OAKWOOD-DAYTON, OHIO

PLAY-SHELTER, SAND-PIT, AND WADING POOL IN THE COURT FOR PRIMARY GRADE CHILDREN, OAKWOOD-DAYTON, OHIO

floors near which and on which they play need the purifying and warming effects of the sun's rays. Adequate protection from glare and from too great heat is needed. Low window-sills admit a greater amount of direct sunlight than the

[3] Play Areas—Their Design and Equipment.—Prepared by the Playground and Recreation Association of America. A. S. Barnes & Co., New York, 1928. 206 pp. Chapters V and X.

Equipment Anticipated During Building Construction

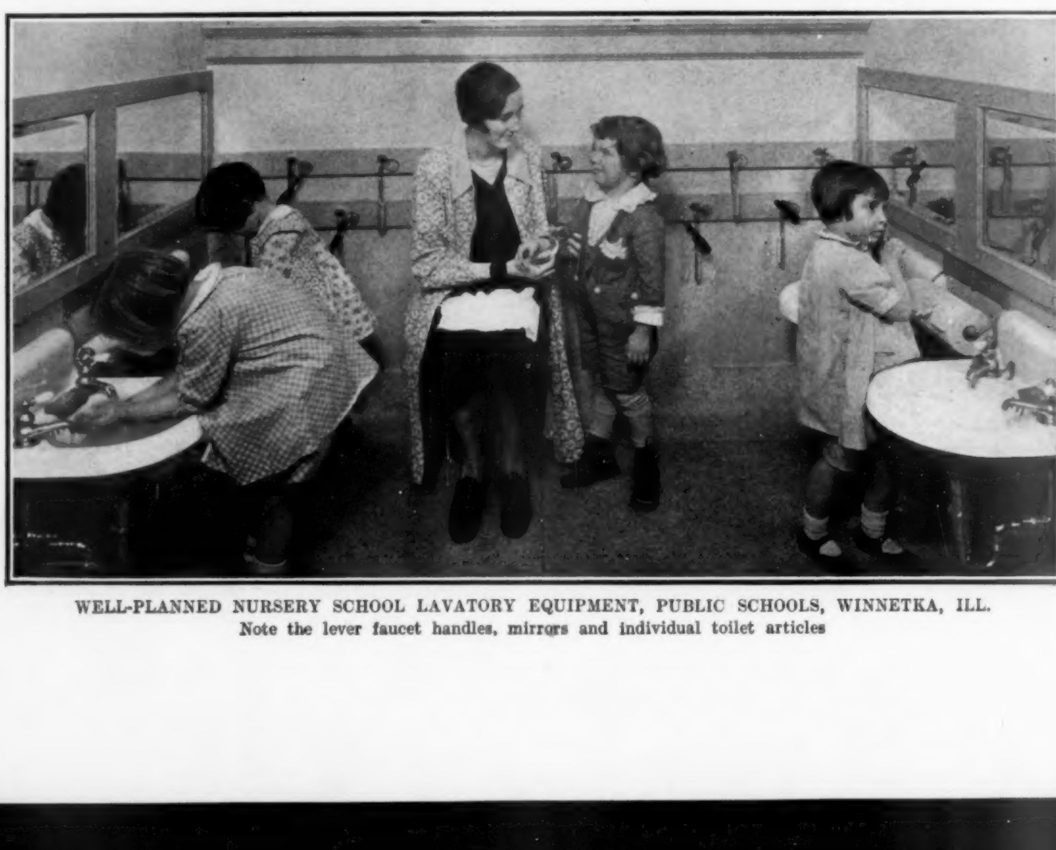
Both expense and delay may be saved by anticipating needed equipment while a school building is under construction. Without this forethought, many pieces of equipment cannot be installed when electric connections are completed

TEACHERS' CABINETS, CHILDREN'S INDIVIDUAL CUPBOARDS AND CHILDREN'S LAVATORY IN A KINDERGARTEN ROOM

A SINK IN THE ALCOVE OF A PRIMARY CLASSROOM

and when supporting joists are concealed. It is possible, however, to make adjustments in a building already erected for the support of physical apparatus and for the installation of many kinds of equipment in the room.

Besides adjoining toilets and lavoratories, which are now generally conceded to be necessary adjuncts to classrooms for kindergartens and primary grades, it is well to provide a sink in the classroom for the children's use in caring for work materials, plants, and pets. Addition of a drainboard at the side of the sink is desirable. In many school buildings a sanitary drinking-



WELL-PLANNED NURSERY SCHOOL LAVATORY EQUIPMENT, PUBLIC SCHOOLS, WINNETKA, ILL.
Note the lever faucet handles, mirrors and individual toilet articles

ADJUSTABLE INDOOR PLAY APPARATUS, WINNETKA, ILL.
Note the platform in the bay window and the low window-sills

fountain is provided either within the classroom or in the hall immediately outside of the room. An electric outlet with a safety device is needed near one of the work centers in the classroom. In many school systems an electric iron and grill are among the supplies provided.

Available space in the wall partitions is admirably adapted for cupboards. The amount of such space depends largely upon the types of heating and ventilating systems employed in the school building, and the resulting quantity of pipe and flues within the walls. Cupboards which utilize this partition space may be placed beneath blackboards or in wall space free from blackboards or display board. These may be used for such bulky supplies as the building blocks, lumber and cardboard for construction work. They may also be used for the cubicles or the cupboards for the children's individual work. Partition space also gives unusual opportunity for deep drawers in

A CORNER IN A PRIMARY CLASSROOM, SAN FRANCISCO

A CORRIDOR LIBRARY, OAKWOOD-DAYTON, OHIO

the supply cabinets customarily provided in classrooms.

Bolts and sockets to support such play apparatus as swings, trapeze, or a climbing gate may be easily installed in the tile or beams of the ceiling or in the wall during construction. Care should be taken to make these bolts and sockets absolutely secure and to place them where the apparatus which they will support will least interfere with lighting fixtures and cupboards.

Raised platforms in alcoves or bay windows add to the sociable appearance of the room and greatly assist the activity programs. Although such alcoves and bay windows are a part of the room, they give a sense of seclusion. They are especially desirable for partially isolating units of work; for example, a library unit, housekeeping equipment, or easels or other equipment needed for creative work. In Des Moines, Iowa, special use of this space is made for the cages of pet birds and animals. To serve as a means for greater protection from other activities, a short section of fencing at the two sides of the platform is effective. The lower step of the platform may be made wide enough for the children to sit on during play activities.

Floor covering or floor finish should be determined during building construction. Four essential characteristics for floor covering are cleanliness, warmth, quietness, and adequate friction to avoid slipping. Floors on which young children play should have as few dust-catching cracks as possible and should be so surfaced that they can bear frequent mopping with water. Two or three coats of shellac give a good washable surface for a wooden floor but it requires frequent

TWO TYPES OF FURNITURE USED IN A FIRST-GRADE CLASSROOM, OAKWOOD-DAYTON, OHIO
Note the light finish for both chairs and desks, and the low window-sills

THIS NURSERY SCHOOL IN WINNETKA, ILL., HAS BOTH OPEN SUPPLY SHELVES AND CUPBOARDS WITH DOORS

Note the display boards, the pictures expressing one main idea, the covered radiators, and the outside exit

renewal. Battleship linoleum of a heavy grade cemented to the foundation flooring has proved most satisfactory in many schoolrooms. A layer of celotex or other building material under the flooring helps to deaden sound. For the nursery school and kindergarten groups, a layer of felt under battleship linoleum or a system of heating pipes adds to the warmth of the floor.

Display boards are as valuable and as necessary a part of equipment as blackboards. Using the same top and base lines for both blackboards and display boards serves both architectural and educational purposes. This keeps an even borderline about the room and gives children the opportunity to pin up their own work and to have pictures hung at a level with their eyes.

It is generally recommended that the height of blackboards and display boards shall be 3 feet from the chalk rail or lower molding, and that these rails and moldings shall be placed 21 inches from the floor in kindergartens, with an increase to 26 inches from the floor in the third grade. In the nursery school this distance should be much less, approximately 15 inches.

Blackboards[4] should be placed opposite windows to avoid glare. There is some discussion of the desirability of a board with a cream-colored background on which black crayon could be used. This color is supposed to be more restful to the eye than black.

Some of the best materials for display boards are celotex, cork matting and linoleum. These may be cemented to the wall and framed with moldings. Nursery schools need the major portion of available wall space equipped with display boards. These not only serve for pictures for the children, but provide a convenient place for posting records for the parents and the teaching staff relative to the day's program and the children's habits. In a kindergarten and first grade a more equal distribution of wall space may be made between blackboards and display boards. In the upper primary classrooms a greater proportion of wall space is needed for blackboards. As an economy of floor space, it is possible to install easels in well-lighted wall space. These easels should be extended approximately 5 inches at the base to make a sloping surface, and beneath this extension

[4] Healthful Schools. May Ayres, Jesse F. Williams and Thomas D. Wood. Houghton Mifflin Co., New York, 1918. 292 pp. p. 52.

THIS CALIFORNIA UNIT SERVES BOTH FOR THE KINDERGARTEN AND AS AN ASSEMBLY HALL

A stage occupies the room to the extreme left

it is possible to construct chalk-trays and boxes for paint bottles.

Tiled window-sills add to the artistic effect of the room and serve many purposes. Bright-colored, glazed tiles add a spot of color to the classroom. They also give a washable and indestructible surface which, when the sills are deep enough, is used for plants and aquaria and for drying the children's craft work.

Three other possible equipment features that need be anticipated during the construction of the building are fireplaces, aquaria, and floor bins. Denver, Colo., has developed some exceptionally artistic designs in tiling and cement work for the fireplaces in the city's kindergartens. Trenton, N. J., has contributed some well-spaced Colonial paneled mantels for both kindergarten and primary grade classrooms. In some instances the fireplace is a matter of decoration and is added without the required chimney flues. While this is attractive, it is disappointing when opportunity arises for building a fire.

Floor aquaria serve many purposes. Plumbing necessary for an aquarium includes the water-supply, water-outlet and overflow pipe. Many of those in use are made of undecorated cement; others are tiled. Those installed in kindergarten rooms in Duluth, Minn., are rectangular, built against the wall with flat, wide tops on which the children may lean or sit. The aquarium in the Beach Park School, West Hartford, Conn., is a shallow pool sunk in the floor of the playroom.

Space beneath the floor has been used in some rooms for sand-pits or for storage bins for the large building blocks. Adequate supports make it possible for the covers of these pits to act as flooring when they are closed. Sunken rings are used as the hardware with which the lids are raised. This device is especially serviceable when floor space is limited.

Furniture

While the plan of equipping a classroom with movable chairs and tables is the one considered here, there are many possibilities for adjusting the "screwed-down" furniture when remodeling old school buildings and using the traditional type of equipment. Several recent studies of seating[5] indicate the care that must be taken in fitting the height of chairs to the needs of individual children. At least three heights are desirable for each classroom, with the added possibility of supplying other heights as needed. Identification marks make it possible for each child to retain his own chair.

A suggested list of chairs and tables for nursery school, kindergarten and primary grades distributed according to heights, follows:

Regular Classroom Chairs

Height	Nursery School	Kindergarten	First Grade	Second Grade	Third Grade
8"	5 chairs	0	0	0	0
9"	12 "	6 chairs	0	0	0
10"	10 "	17 "	0	0	0
11"	3 "	11 "	6 chairs	4 chairs	0
12"	0 "	2 "	17 "	10 "	9 chairs
13"	0 "	0 "	11 "	17 "	10 "
14"	0 "	0 "	2 "	5 "	17 "
15" (for teachers)	2 "	2 "	2 "	2 "	2 "

THE DOUBLE CUPBOARDS IN THIS KINDERGARTEN ROOM, DOWNER'S GROVE, ILL., PROVIDE STORAGE SPACE FOR BOTH THE TEACHER AND THE CHILDREN

Note the work shelf between the cupboards, the transparent curtains and the aquarium

Six wicker or wooden arm chairs; four straight and two with rockers for the reading table or the play house. Two Windsor chairs for visitors.

Regular Classroom Tables. Table tops 18 x 36 inches seating 2 children each

Height	Kindergarten	First Grade	Second Grade	Third Grade
19"	9 tables	0	0	0
21"	9 "	9 tables	0	0
23"	0 "	9 "	10 tables	8 tables
25"	0 "	0 "	8 "	10 "

Two round folding tables, 36 inches in diameter, for each classroom, one each of two heights to be used for library and housekeeping purposes. For the nursery school, four round folding tables 36 inches in diameter, 17 and 18 inches high.

Miscellaneous equipment[6] needed includes a

[5] Kindergarten Seating.—Beatrice Anderson, Corrective Teacher, Los Angeles City Schools. *Sierra Educational News.* 25: 10, p. 20. December, 1929.

A Study on the Seating of the Kindergarten and the Primary Grades. A comparison of fixed seats, movable chair-desks, and tables and chairs for the primary grades.—L. D. Lundberg. Flint, Mich., Dept. of Research and Statistics, Public School System, 1928. 14 pp. (mimeographed).

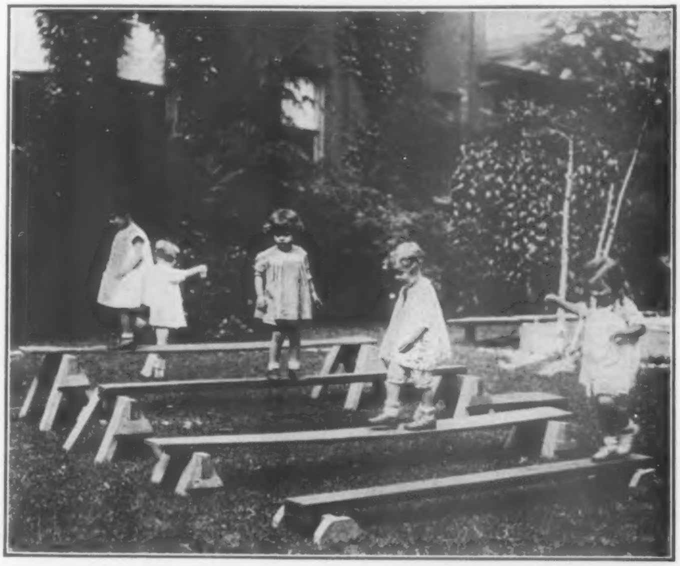
Survey of Seating in Grand Rapids Elementary Schools.—Grand Rapids, Mich., March 4, 1929.

[6] Nursery School Equipment.—Christine M. Heinig. *Childhood Education,* 5: 302-306. February, 1929.

Permanent Play Materials for Young Children.—Charlotte

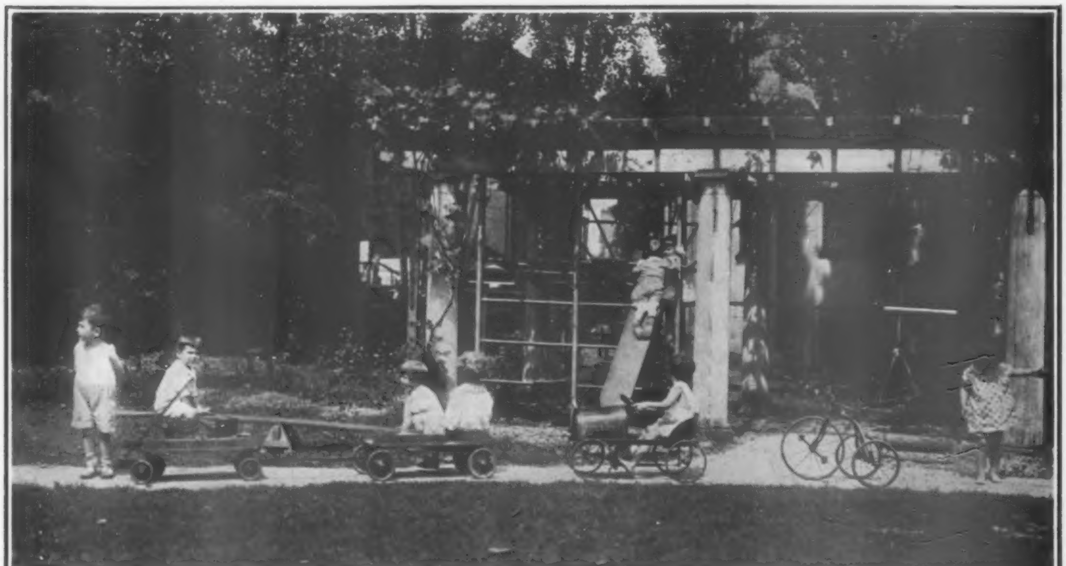
bench for woodworking, a sand table, a box for holding wood scraps or building blocks, painting easels, movable screens and folding cot beds. A wall desk for the teacher conserves floor space and helps to avoid the formality of a large desk in the classroom.

Cabinets for supplies or for storage of individual children's work may be built into the room or mounted on heavy noiseless casters to be moved about the room. When built under the windows, space may be left in such a cabinet for a window-seat and bookshelves. Bins for paper and for a reserve supply of framed pictures may also be made a part of this cabinet. A hinged top for the window-seat provides additional storage space. When built against a wall, the space above the cabinet may be used to advantage for display board. In this cabinet the children's storage space may be provided in the form of cubicles, drawers or partitioned open shelf space. An acceptable size for the cubicles is 10 inches by 10 inches by 13 inches, and for the drawers, 14 inches deep, 14 inches long and 6 inches high. A cabinet 36 inches high and 11 feet long provides space for 36 such cubicles, and a 10-foot cabinet 30 inches high provides space for 32 drawers of the dimensions previously given. Open, unpartitioned shelves are generally preferred for nursery school children. This plan makes the play materials immediately accessible and avoids the possibility of young children pinching their fingers in the doors. For older children both sliding and



BOARDS OF DIFFERENT WIDTHS AND THICKNESSES, USED WITH "HORSES" OF VARYING HEIGHTS, OFFER INCREASINGLY DIFFICULT PROBLEMS IN MOTOR CONTROL AT THE NURSERY SCHOOL OF THE WASHINGTON CHILD RESEARCH CENTER

G. Garrison. Charles Scribner's Sons, New York, 1926. 118 pp., illus.
School Activities and Equipment.—Rose B. Knox. Houghton Mifflin Co., New York, 1927. 368 pp., illus.



A PERGOLA WHICH PROVIDES NECESSARY SHADE IS USED TO SUPPORT BOTH CLIMBING AND SWINGING APPARATUS AT THE NURSERY SCHOOL OF THE WASHINGTON CHILD RESEARCH CENTER

The cement walk gives a proper surface for the use of wheel toys and is so laid that it satisfies the children's desire for adventure

hinged doors have given satisfactory service.

One other effective piece of equipment is a "drying bench" devised for the children's coat rooms in Rochester, N. Y. Over a coil of large steam pipes a slatted bench is constructed with wide spaces between the slats to permit the heat to rise easily. This device has solved the problem of caring for wet wraps in snowy and rainy weather.

Play Apparatus

Apparatus designed especially for physical development offers a constructive and legitimate outlet for the children's activities. It may be constructed[7] both for the classroom and for the playgrounds, where it will be available for use during the whole day's program. Such equipment should be designed to make use of the larger body muscles, especially those in the abdomen, back, chest, and arches, and to promote proper posture. Movable equipment should be of proper size and weight to insure easy manipulation by the children, yet providing weight enough to offer some resistance in lifting. Whenever possible, such equipment should be made adjustable, so as to provide for children's growth in stature, in strength, and in interest in creative play. When necessary, many pieces of apparatus may be constructed by local carpenters. Great care should be taken that such apparatus be given an adequate foundation and be made absolutely secure. For apparatus to be used out of doors, the use of thoroughly seasoned wood will tend to eliminate warping or cracking. Wood should be selected according to the type of equipment under construction. Due consideration must be given to such important factors as strength, resistance to decay, flexibility, splintering and availability. Outdoor equipment should be kept well painted as protection from the weather. A satisfactory undercoating consists of aluminum powder and high-grade spar varnish in the proportion of two pounds of powder to a gallon of varnish. Two coats of this mixture are needed, allowing twenty-four hours between coats, after which one or two coats of lead and oil of any desired color may be applied. It is interesting to note that Chinese red, and bright blue-green colors are among those being used both for indoor and outdoor play apparatus.

Walls should reflect and simulate light. A warm cream color does this satisfactorily. Bright colors, carefully selected and harmonized, are being introduced for the classroom woodwork and furniture. In some instances the chairs and tables or the wood trim introduces the color. In other instances the color is confined to furniture for one section of the room, such as the library or housekeeping unit. As much care need be taken to avoid an exciting color scheme as to provide one which adds life and vitality to the classroom.

This discussion will doubtless bring to the reader's mind many other ideas for the plans and equipment desirable for nursery, kindergarten and primary shools. There will doubtless be objections to some of the suggestions offered. This is both natural and healthy. There should be, however, a definite educational value and purpose for each plan, design and arrangement of equipment provided, and each of these should be adapted to the size, abilities and interests of the children concerned. Beauty, simplicity, purposefulness and efficiency characterize the completed schoolroom. This environment invites a child to experiment, to cooperate and to achieve.

[7] Housing and Equipping the Washington Child Research Center. Mary Dabney Davis and Christine M. Heinig.—*School Life*. December, 1929, and January, 1930.

Music Rooms in General, and Sage Hall in Particular

BY ROY D. WELCH

CHAIRMAN, DEPARTMENT OF MUSIC, SMITH COLLEGE

MUSIC rooms best serve their purpose when they are constructed and decorated in such ways as will put those who use them physically at ease. That such rooms should be acoustically satisfactory goes without saying. There is, however, in many rooms designed for this purpose, an apparent disregard of the fact that physical discomfort and distractions tend to defeat the purpose for which the rooms are built. It would almost seem as though many concert halls, and the conditions under which concerts are given, make performance and listening as difficult as possible. The effects of uncomfortable seats, bad lighting, crowding, and tasteless decoration have constantly to be overridden by performers and listeners.

The Comfort of the Audience

Obviously, no one formula or one set of specifications would be appropriate to all circumstances. Some general principles, however, are to be deduced from the experience of musicians and their audiences. Ideally, performers should not be too much cut off from their hearers. Elaborate proscenium arches, wide distances between platform and seats, or a platform built so high that an audience is conscious of an uncomfortable angle of vision, is altogether undesirable. Under

SAGE HALL, SMITH COLLEGE, NORTHAMPTON, MASS.
View from the athletic field

most circumstances, an audience needs relatively little light; and though different kinds of performances make different demands, the lighting on the performers, while it must be adequate for the reading of notes or for comfort at an instrument, must be kept from focusing attention upon itself.

Color schemes also need careful attention. In one well-known hall the white paneling behind the performers and the angle of the lights tire the eyes of the audience and reduce performer and instrument to a silhouette. The shape of concert halls and their proportions are matters to be left to acoustical experts. But in those halls that are most satisfactory the architects have avoided such corners and alcoves as give their occupants a feeling of remoteness. The scheme of decoration in certain music halls calls far too much attention to itself. Simplicity, even though it be achieved by very complex means, is obviously highly desirable.

The Music Classrooms

These desiderata of concert halls are equally important in classrooms chiefly devoted to the teaching of music. Here, too, and with even greater emphasis, there is need of avoiding distraction. Moreover, as music is an art, it deserves, when circumstances permit, to be put among surroundings, even in the classroom, that are not anomalous with its nature. Specifically, the following details deserve especial attention. Failure in any one of them is discovered by experience genuinely to affect the efficiency and the objective of the classroom teaching of music. They are the irreducible minimum of classroom comforts.

First, the seats should be separated from one another in such ways that the desks do not interfere with the convenience of neighbors. Second, the piano or other instrument, the blackboard, the table for the teacher's materials, should be so elevated that students are not put to physical strain in raising their eyes from their books. Third, the decoration should not attract attention. Simple paneling in dark colors is desirable. In classrooms as in other rooms intended for music, the acoustical problem is obviously of the highest importance.

Making Phonographs, Pianos and Music Accessible

There has been developed in American schools and colleges in the last few years a very great interest in studies in the history and appreciation of music. Such work needs special equipment. The ultimate objective of such studies is a knowledge of music; obviously, music cannot be known unless it is freely available. The various mechanical means of reproducing music, recently so enormously improved, make available to teachers and students a very acceptable, indeed indispensable, means for accomplishing their purpose. These reproducing machines, either pianos or phonographs, should be made accessible to students as easily as books in libraries. Consequently, rooms should be set aside for them—rooms again properly decorated, with long tables and distinctly comfortable chairs and proper ventilation. Racks or cases for storing material are needed, and these rooms should be soundproof so that they can be used freely at all times without disturbing adjacent rooms.

SAGE HALL AUDITORIUM

ONE OF THE STUDIOS

The Storing of Music

Studios in which private musical instruction is to be given should satisfy the same demands as are mentioned above in connection with the other teaching rooms. In addition, most teachers would find it extremely convenient if architects would work into their plans some provision for proper shelving of music. Musicians who own and use a large quantity of music find its handling an uncomfortable problem. Shelves of the proper width and distance from one another to allow of shallow piles of music are convenient. Unbound music is best preserved in boxes conveniently made with a hinged cover. Where music is stacked in large, loose piles, damage is not easily avoided nor is a particular piece easily found.

In many schools and colleges special library facilities must be provided. Preferably, these libraries should be freely open to the students. When tables are provided, and open shelves, there is an invitation to the use of these facilities. Here, again, the storing of music, especially unbound music, is a serious matter. In some places, cardboard boxes of the proper shape and size, and with attachments for handling and for cataloging, partially solve this difficulty. These boxes, shelved flat, a shelf to each box, are easily drawn out and replaced. Where collections of phonograph records or of rolls used in mechanical pianos are part of the equipment, it is again important that proper cabinets be devised. In most institutions it is necessary to have a room for the storing of orchestral and band instruments.

A Three-Unit Music Building

Sage Hall, the music building at Smith College, is constructed in three adjoining but quite separate units. The chief purposes to which these units were to be put suggested this method of construction in order that there might be no disturbance of the activities of one by those in the other. There is, first, an auditorium at the street front of the building. It is a chamber music hall, seating about 800. Acoustically, it is highly satisfactory. Built in an octagon, its reflecting walls and the ceiling covered with soft material, it is attractive to the eye and happily avoids dead corners or unpleasant reflections of sound. Its simplicity is greatly in its favor in view of its purpose.

Adjoining this first unit of the building, and communicating with it through steel doors and other entrances, is a section given over to teaching rooms, studios, offices, and library. All the rooms in which music is to be at any time heard are kept on one side of the corridor and they are soundproofed sufficiently to prevent interference. Single soundproof doors are provided for each of the studios. On the other side of the corridor, in separate stories, are teaching-rooms for theory of music, offices, and the library. These rooms are not disturbed by sounds from the studios. In the first weeks of occupancy it was found necessary to add to each of the studios wall hangings to correct acoustical conditions. These hangings of monk's cloth not only serve an acoustical purpose, but are decorative as well.

The third unit of the building, again connecting with the second, is given over wholly to practice rooms. There are thirty-six of these rooms, in four stories. Each is large enough for a window, a grand piano, a small table, and a chair. The soundproofing is satisfactory. Soundproof doors are provided and soundproof panels which are also pleasant to look at.

The terrain made necessary a long and narrow building, but this proves to be an advantage, separating as it does the three units. The architectural style is Georgian, with separate entrances for each of the main parts of the building.

After Five Years of Use

The most satisfactory detail of the building is the chamber music hall. The chief teaching-room, a lecture hall seating about 200 students, recommends itself in several particulars, but in one that deserves to be especially mentioned. Here there is provided a platform, high enough to bring the teacher and his instrument within range of vision of the students, but not so high as to put them to an uncomfortable strain in looking up from their books. Special rooms are provided for work with phonographs. These rooms, tastefully decorated and provided with long tables, invite use.

The library facilities are also very satisfactory. There is, first, a large main room with shelves on all the available wall space. Certain sections of these shelves are given over to the storing of music, some of it in boxes, some of it bound. Movable shelves have made the arrangement of material convenient. There is table space for sixty students. All books and music are on open shelves. There is also in this main room a catalog file and a desk. Adjoining it is a small room for the librarian and, in turn adjoining that, a room especially for the study of large scores. Here are kept complete editions of the chief composers, and here is table space and sufficient chairs for about ten students. This room is used chiefly by those well advanced in their studies. A freight elevator saves an immense amount of labor and expense in the moving of pianos. The platform of the chamber music hall is on the level with the corridors, and in consequence pianos can be rolled in without difficulty. There is also a room for the storing of orchestral instruments.

Among the defects of this building the most important is the partial failure of the soundproofing devices. This failure is, however, not so complete that when two students in adjacent rooms are using pianos one is disturbed by the other. Another, relatively unimportant, defect is the lack of provision for the storing of music in the studios. These and a few other minor defects do not, however, seriously disturb the use of the building.

Harry Leslie Walker, Architect; George D. Strayer and N. L. Engelhardt, Educational Advisors.

THE BRONXVILLE, N. Y., PUBLIC SCHOOLS OCCUPY THE WINGS OF THIS RECENTLY COMPLETED BUILDING
The Library, in the center, is the connecting unit

Planning the Elementary School Library

BY WILLARD W. BEATTY

SUPERINTENDENT OF SCHOOLS, BRONXVILLE, N. Y.

NEWER ideals in the teaching of reading have operated in the last few years to transform the grade-school emphasis on books. Not long ago it was considered sufficient for our classrooms to be equipped with one set of graded readers, containing fragments from the English classics. While this still holds true in some parts of the country, and particularly in rural sections, the scientific work of our colleges of education has demonstrated the tremendous importance of extensive as opposed to intensive reading. Where the leaven of this knowledge about better reading instruction has begun to operate, supplementary readers are finding their places on the classroom reading shelves. Where there is a complete recognition of the ease with which instruction in reading may be individualized and the reading interests of children served by a variety of books, rather than a potpourri of excerpts distributed by sets, the library is finding its way into the elementary school.

A survey in 1928 by the National Education Association, Research Division, of school-building trends in 20 of the larger cities, showed that 24 out of 58 newer elementary buildings were equipped with libraries. This may be contrasted to 32 new junior or senior high schools, in 26 of which libraries were included. While far from ideal, these facts indicate the tendency toward elementary school libraries to be widespread throughout the country.

Because a recently completed addition to the Bronxville Public Schools contains library provision of an unusually complete type, we have been requested to discuss the plans, even though the building is somewhat unique in that elementary, junior and senior high schools are all included within the one plant, and are all equally served by the libraries.

A glance at the ground plan of the building shows the library unit conveniently located with regard to the three school units, on the second floor of the central portion of the building. To the south, along the main frontage, a senior high school of 196 pupils is housed. To the north, and extending to the rooms immediately adjacent to the library, the plant is given over to 750 elementary pupils. The east wing, to the rear of the main structure, accommodates 242 junior high students. Located directly over the

main entrance and at the intersection of the second floor hallways, the library is equidistant from all three units.

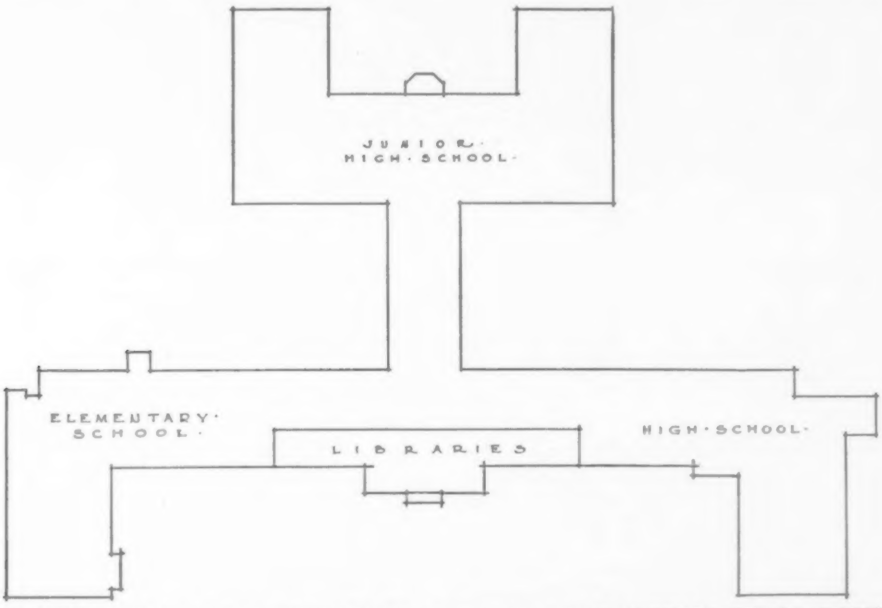
Factors Which Influenced the Plans Adopted

In planning the library unit, a great deal of consideration was given to the recommendations of school librarians, desirable libraries in the schools and colleges of the New York area were visited, and the needs of our own school carefully weighed.

Economy in administration and maximum circulation of library books dictated the concentration of library facilities where they would most conveniently serve all three schools. However, the breadth of age-span demanded some provision for segregating the younger from the older children. The problem of wisest handling of free textbook distribution had to be met; the best means of making reference books available for study-hall use had to be found; adequate work facilities for the librarians had to be provided, and sufficient storage space for textbooks not in use needed to be found.

When the new building was contemplated, the north and south wings, housing elementary and high schools, respectively, already existed. The expansion program demanded a duplication of existing space, to accommodate rapidly increasing population in both schools. A central, connecting unit seemed the logical answer, with the library as the dominating feature of the architectural scheme. A broad-visioned Board of Education conceived a room of imposing proportions, escaping from formalized schoolroom atmosphere, and exerting an influence of restful beauty upon its visitors. With these considerations before them, superintendent and architect set to work.

Bearing in mind all the factors mentioned above, the library suite was visualized as composed of a general reading-room in the middle, with a separate primary reading-room at one side, and a high school reference room at the other. A librarian's workroom was seen as another essential, as well as a place for "dead storage." It seemed at first an extravagance to devote space on the most attractive façade of the building to these accessories, and we considered placing them both on the attic floor above. Further study convinced us that separation of the workroom from the library suite would be time-wasting in the extreme, so it was included adjoining the reference room—and the "dead storage" consigned to the attic, connected with the library by means of a dumbwaiter, designed to carry a specially built book truck.



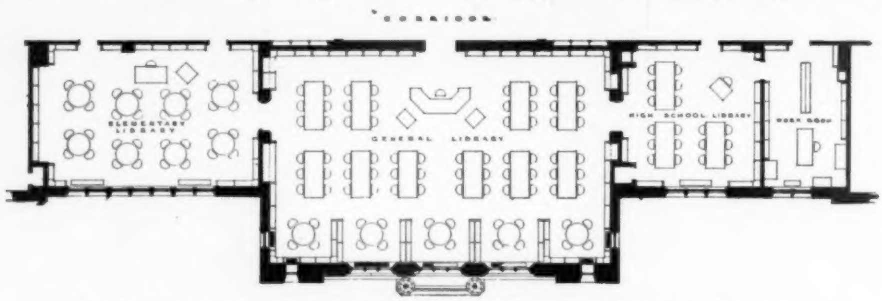
THE GROUND PLAN OF THE BUILDING WHICH HOUSES THE BRONXVILLE PUBLIC SCHOOLS

Combining the Advantages of Classroom Libraries and Centralization of Books

With this allocation of relative space, arose the question of actual floor space needed. The elementary room was considered first. A product of evolution, our elementary library has its roots in the classroom. Four years ago no separate library existed, but each elementary teacher strove to build up within her own room as rich and generous a classroom library as the book fund in the annual budget, plus the activities of the parent-teacher organization, could provide. These classroom libraries frequently reflected the personality or individual initiative of the respective teachers. Some were rich in books suited to the age-grade of the children; others betrayed

special interests of pupils or teachers, to the detriment of well-rounded variety; some possessed books covering a grade span of several years, to stimulate the reading interests of pupils of widely divergent interests; others were outgrown because children remained two years in the same room. New teachers, opening new rooms in response to the rapid increase in school enrolment, presented classroom book lists of staggering proportions, yet reasonable in view of the school's determination to foster extensive reading. The entirely legitimate demand for duplication of expensive reference material alone made the need for an elementary library acute, and, as a result, an entirely inadequate space was set aside for library purposes three years ago, and the growing classroom libraries concentrated in this central spôt. While recognizing the advantages of the new centralization of books, classroom teachers objected to the loss of their room libraries. No amount of explanation of the greater variety of reading opportunities provided by the new arrangement satisfied their complaints, so a compromise was hit upon which provided for these books during the summer, and it must be relatively easy to handle and exchange them monthly. It must not be imagined that this arrangement satisfies the library needs of the children in the grades. Far from it. It merely supplies material for incidental classroom reading. A modern school has the additional responsibility of building up home reading habits which will eventually send the children to the public libraries as regular patrons, and of cultivating an appreciation of good literature which will stand sponsor for the books permanently acquired for the home library.

This means that the children must be permitted to visit the elementary library individually at designated times to withdraw and return books, securing advice from the librarian—and that times should also be arranged when whole classes may visit the library to become acquainted with library methods and location of books, and for reference purposes. This necessitates a library at least as large as a classroom, with similar if not a slightly greater seating capacity, for class groups may come at times



FLOOR PLAN OF THE LIBRARY FOR THE BRONXVILLE PUBLIC SCHOOLS

tended to preserve the values inherent in both schemes.

Each classroom was allowed a rotating library of not to exceed thirty volumes, chosen by the teacher in cooperation with the librarian, and changed monthly. In selecting these books, an effort was made to choose a wide variety from the standpoint of interest and difficulty, so as to stimulate new reading interests as well as satisfying existing ones. Each classroom was equipped with a circular reading-table near the bookcase, and on this table many of the new books received each month were displayed. A record of books thus distributed among the classrooms was of course maintained in the library, and if any of these volumes were called for in the usual way, the librarian either placed the child's name on the waiting list for the given book, or, if the case was sufficiently important, recalled the book from the classroom where it was on loan, provided it was not in use.

Meeting the Needs of the Elementary School

In an elementary school of twenty-five rooms, this means that a very fair number of books is in constant circulation. Storage space must be when individuals from other classes are engaged in reference work which should not be interrupted. With an average classroom enrolment of thirty, at least eight round tables, seating four each, are needed to satisfy these demands,, for we find ourselves, after several years of experimentation, prejudiced in favor of round tables in the elementary group. This called for a room about 36 x 22 feet, which we therefore decided upon.

Special Angles of the High-School Problem

The high school problem presented its own angles. The recommendations of school librarians generally we found to be against combining study hall and library. After consulting a large number of school librarians, we came to the conclusion that the main objection to the combination appeared to be that study-hall discipline was injurious to library atmosphere. Libraries were conceived of as places where children should want to come, and therefore their stay should be conditioned on good behavior. Study halls, on the other hand, were thought of as unpleasant places to which children *had* to go,

INTERIOR OF THE RECENTLY COMPLETED LIBRARY FOR THE BRONXVILLE PUBLIC SCHOOLS, AWAITING THE INSTALLATION OF EQUIPMENT

and which as a consequence aroused a distaste reflected in their behavior.

Balanced against this was our own experience that it was largely during study hours that children were free to consult the library. The separation of the two then reduced itself to a duplication of space for what appeared to us an inadequate reason—especially as we wanted our study hall to be an attractive spot conducive to concentration and with all the desirable factors helpful to research present or available. Previous experience with a smaller library in the high school which had served in this dual capacity, and where the librarian had been given authority to enforce library courtesy and quiet, gave evidence that the combination was not only feasible, but appeared to meet most admirably our needs.

A study of our program indicated a maximum junior-senior high-school study-hall population of not over 70 at any one period. We therefore determined on a main reading-room to seat this number—about 56 x 34 feet—and added to this a reference room about 23 x 21 feet, with a capacity of 18 to 20 pupils.

Opening from this reference room was placed the librarian's workroom—a space about 23 x 13 feet—with the clear area near the windows for desk and work tables, and the remainder of the room equipped with shelving for storage of books awaiting accessioning, repair or rebinding.

In planning the main reading-room, it was felt that the added depth acquired by the projection of this unit of the building slightly forward, demanded more than the usual height to adequately light and balance the room. The lengthy frontage of the building, with the projecting end wings of auditorium and gymnasium, also demanded significant treatment of this central bay. The problem was solved by allowing a story and a half of height to the library, which, with a small auditorium above, gave height and dignity to the central façade, and allowed for the large and graceful Gothic windows illuminating the library. These windows were treated with an antique leaded glass, slightly tinted, with central panels carrying the "printers' marks" of twenty-seven of the early mediæval printers.

In the elementary library, all the walls were lined with shelving to a height of 4½ feet. A librarian's small charging desk was placed opposite the windows, flanked by the catalog file, and eight round tables of varying heights, equipped with posture chairs, were furnished for the children. The reference room was similarly equipped with shelving, a librarian's small desk, and three rectangular tables, seating six each. A straight-backed Windsor chair with posture seat was used in this room, as in the main reading-room.

Seating and Lighting

After a study of numerous libraries, we rejected the customary end seating, as in conflict with our ideal of proper lighting for each reader. If the theories upon which classroom seats are not placed with faces or backs to the light are

sound,—and we have reason to believe that they indicate desirable practice,—we fail to see the reasonableness of violating such health rules in a library where reading is to be the chief activity. For the sake of variety, round tables were chosen for the alcoves near the windows, with seats at the 45-degree axes, as in the elementary room, and rectangular tables seating three to a side for the remainder of the room. With the charging-desk just inside the main doorway, flanked by dictionary and atlas stands, we gave a good deal of study to the location of catalog drawers and other files, with the result that we decided to build them into the walls where construction provided a double thickness between the main and subordinate reading-rooms. This kept the main floor space clear of obstruction to circulation or sight lines from the charging-desk.

For the last few years, we have had a steadily growing demand for the conduct of an evening study hall for high-school boys. The old library has been used for this purpose, and it was intended to transfer this group to the new main reading-room. Therefore, in addition to the main chandeliers, the main reading-room has been equipped with indirect lighting, from reflectors above the 7-foot book-shelves, to supply a mellow glow to the room as a whole, and then a group of tables used for study-hall purposes have been supplied with reading lamps.

Handling Textbooks Through the Library

The last problem which we discussed was again one with regard to which we found ourselves not in accord with the recommendations of librarians generally—the matter of handling textbooks through the library. While we recognized situations in which another method of distributing and collecting textbooks might prove more desirable, we came to the conclusion that in our own situation the library was the proper source of textbooks as well as library books. Several reasons entered into this decision. Under our scheme of individual instruction, not all textbooks for a class are given out and collected at the same time—individual children may be turning-in their books at any time, when they finish a given section of work. Where is a more natural and logical place to go for the new book than the library? Furthermore, we have attempted to secure for text material, wherever possible, the most interestingly arranged and attractively prepared material available to meet our needs. We wish to break down the old idea that textbooks are uninteresting and of a class apart. We want them to be thought of as books, primarily, and textbooks later, if that be inevitable. Therefore, from the psychological standpoint, it seemed that the textbook should issue from the library, just as would any other book. To relieve the pressure on the librarians, extra help is supplied at periods when many textbooks are being given out or returned—as at the beginning or end of the school year. Special textbook record cards are prepared to facilitate the maintenance of each child's textbook record.

It is yet too early to predict whether we have satisfactorily solved all our problems, but as the building has approached completion, we have been impressed with the architectural success of the location and treatment of the group of rooms. A few months of actual use will serve to furnish a reply to the other questions, which we hope will be equally satisfactory.

TYPES OF EQUIPMENT INSTALLED IN BRONXVILLE PUBLIC SCHOOLS

Blackboards—Natural Slate Blackboard Co.
Boilers—H. B. Smith Co.
Cafeteria Equipment—Duparquet, Huot & Moneuse Co.
Classroom Furniture—P. Derby & Co., Inc.
Clocks and Signal Systems—International Time Recording Co.
Doors—Hyde-Murphy Co.
Drinking Fountains—Halsey W. Taylor Co.
Fire-Alarms—Edwards & Co., Inc.
Gymnasium Equipment and Furniture—A. G. Spalding & Bros.; Narragansett Machine Co.
Heating and Ventilating System—Buckeye Blower Co.
Heat Regulating System—Powers Regulator Co.
Interior Telephone Equipment—Western Electric Co.
Laboratory Furniture and Equipment—Kewaunee Mfg. Co.
Library Equipment—Yawman & Erbe Mfg. Co.
Lockers—Durabilt Steel Locker Co.
Partition-Shower, Toilet—Henry Weis Mfg. Co.
Plumbing Fixtures—Standard Sanitary Mfg. Co.
Shop Equipment—Yates-American Machine Co.
Sprinkler Systems and Fire Fighting—American-La France & Foamite Corp.
Valves—Sloan Valve Co.
Window Shades—Columbia Mills, Inc.

How the Platoon Units in the Long Beach City Schools Are Used and Planned

BY HOSEA A. WHITENECK

DIVISION OF ADMINISTRATIVE RESEARCH, LONG BEACH (CALIFORNIA) CITY SCHOOLS

ELEMENTARY school buildings may be classified with respect to organization into two types of construction—the traditional type of school, and the platoon type of school. The platoon school should provide for fundamentals, leisure time, health, social-civic, social-science, and vocational activities.

The home room is the regular school home for the pupil. The home room teacher exercises the same supervision over the pupil for three hours per day as is exercised by the teacher in the traditional school. The home room teacher co-operates with the other teachers in planning the pupil's work, keeps in touch with his progress and conduct, and reports these facts to his parents.

The home room teacher is responsible for the fundamentals or formal subjects. It is in this room that arithmetic, reading, spelling, and English are taught. The home room organization, with the instruction of most of the fundamentals, in the hands of one teacher, is an important factor in the organization of the platoon system.

The leisure-time activities include music, art, literature, and library. Ro ms are constructed to care especially for these activities. The music room provides for both instrumental and vocal music. The art room is constructed especially to emphasize training in applied art, and the room for literature is planned for the purpose of emphasizing the appreciative side of literature.

Library instruction in the platoon school is included as an integral part of the elementary curriculum. A library room especially designed and furnished for library instruction is provided in all the platoon buildings. It is intended that, from the first years in the elementary school to the last year of the high school, children shall continually be brought in contact with good library facilities and with well-trained library teachers who can direct their library reading, make them familiar with library procedure and arouse in them a desire for good literature.

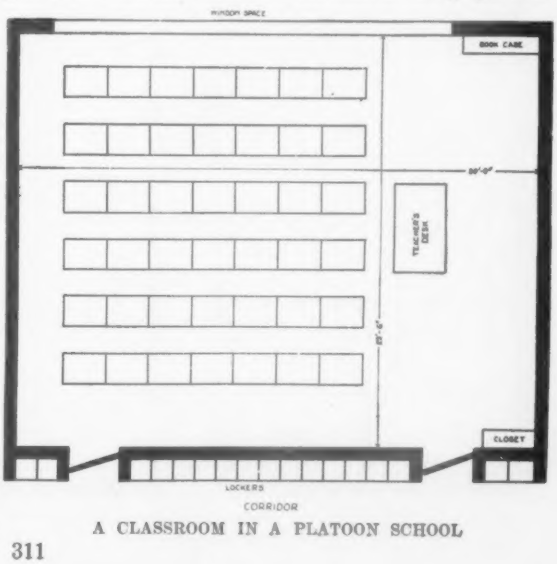
The health unit provides for the gymnasium, playrooms, and boys' and girls' shower and locker rooms. In addition to the playrooms, provision is made for outdoor play periods. In Southern California outdoor play periods are provided the year around. The playrooms are not an essential unit in this climate.

The auditorium is the important unit of the social activity. If we accept Dewey's philosophy that the aim of education is social, then the purpose of the auditorium is to socialize the pupil. The auditorium is the place where the activities of the whole school may focus. With this aim in view, the auditorium of the platoon school has been designed to accommodate two groups of pupils at the same time.

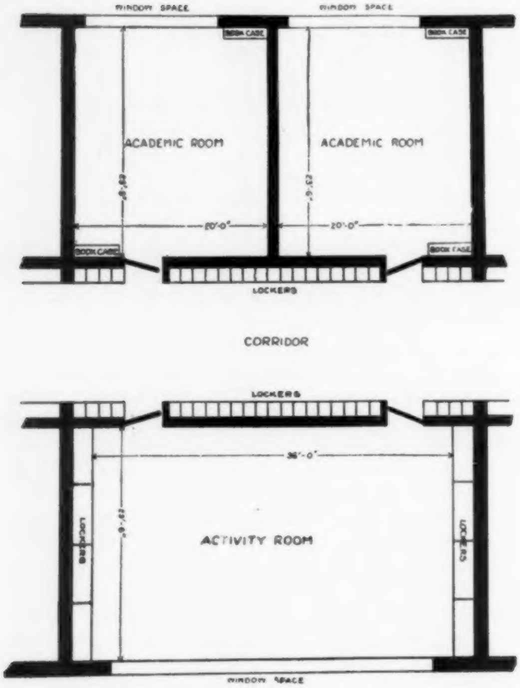
The rooms for social science activities are organized and planned specifically for nature study, geography, history and civics. The social science rooms provide for herbariums and aquariums and such other equipment as will make the teaching of nature and geography effective.

The vocational activities provide manual arts for the boys and homemaking for the girls. The manual training rooms and the homemaking rooms are designed to accommodate the pupils of a particular community, the design being different for each community. The manual training and the homemaking rooms each accommodate about twenty pupils at one time; thus it will be seen that it requires both of these rooms to count as one unit in the general scheme of organization.

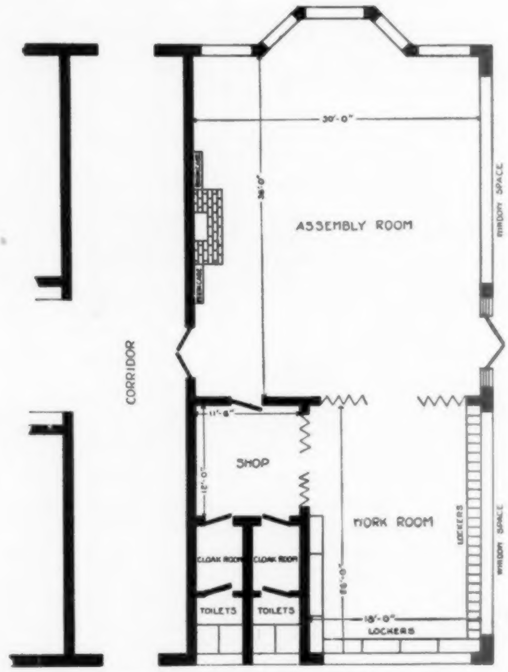
The platoon buildings are planned to include features which lend themselves for efficiency in administration. The rooms for the special activities are planned for the first floor, while the home rooms are planned for the second floor. The platoon organization requires a change of classes between special rooms at the end of each half-hour. Only twice during the day, once in the morning and once in the afternoon, is there a change of pupils between the special rooms and the home rooms. Grouping the pupils in home rooms on the second floor leaves the pupils un-



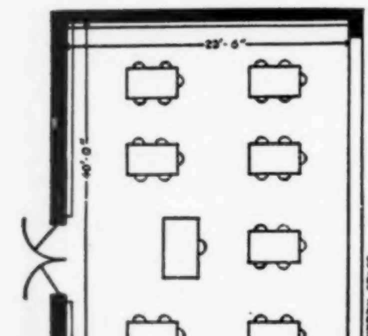
A CLASSROOM IN A PLATOON SCHOOL



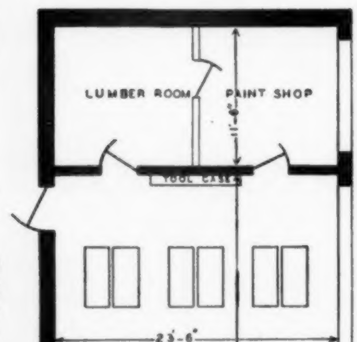
A FIRST-GRADE UNIT IN A PLATOON SCHOOL



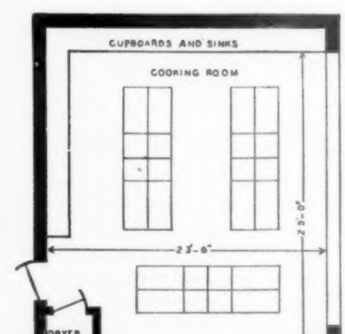
THE KINDERGARTEN IN A PLATOON SCHOOL



PLAN OF THE LIBRARY IN A PLATOON SCHOOL



PRACTICAL ARTS-MANUAL TRAINING ROOMS



PRACTICAL ARTS-HOME MAKING ROOMS

disturbed by these half-hour changes in the special rooms on the first floor.

Rules for Planning New Elementary School Buildings

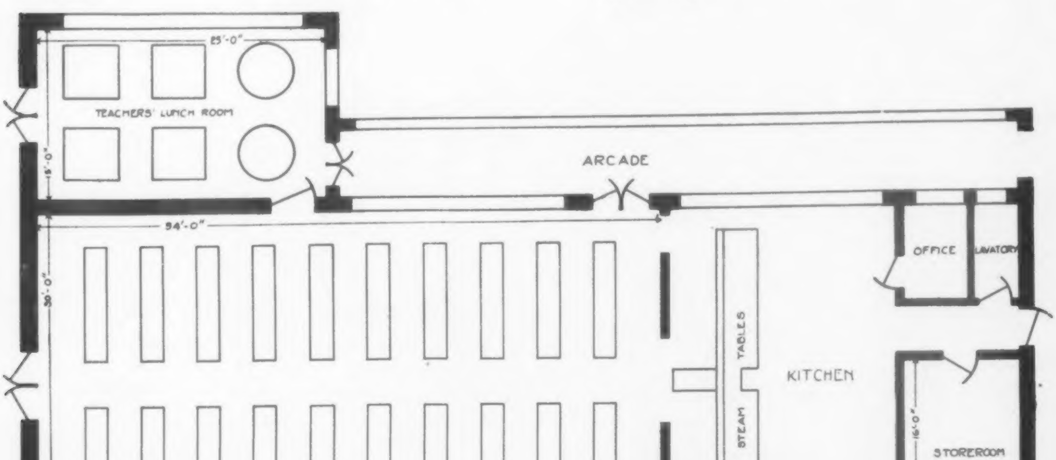
1. Elementary school buildings shall be designed to accommodate either the traditional or the platoon type of school organization.
2. They shall be two stories in height.
3. Elementary school buildings shall be of the open type construction, thus securing the best possible light and ventilation.
4. So far as practical, additions shall conform in design to the building already erected.
5. The elementary auditorium shall be built primarily for instructional purposes.
6. The size of special rooms, such as manual training, home economics, social science, etc., shall vary according to the needs of the community.

Floor Areas

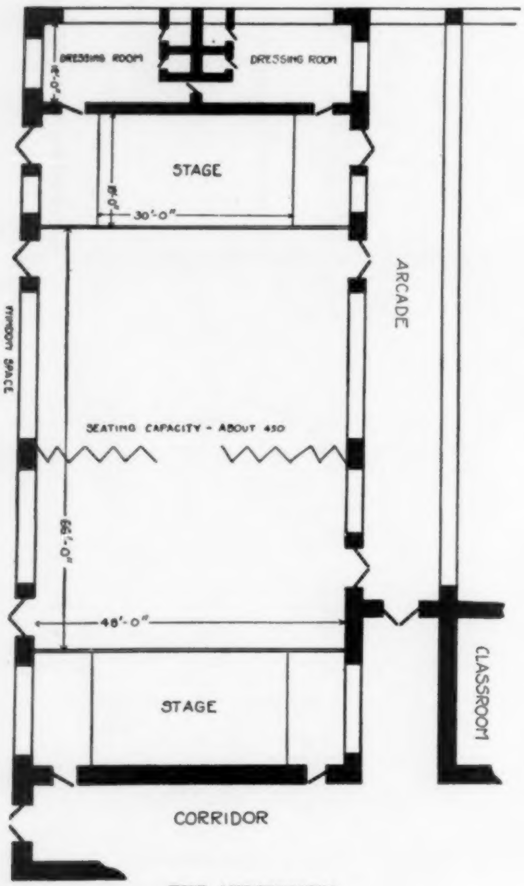
1. General classification of floor areas in elementary school buildings
   - a. Instruction units
   - b. Administration units
   - c. Stairs and corridors
   - d. Walls and partitions
   - e. Accessories

2. Rules for measuring and classifying floor areas
   - a. The entire floor areas of the building together with that part of the used basement shall be included in the tabulation. This sum of all the floor areas and the used part of the basement is taken as 100 per cent.
   - b. The line of measurement for areas of all floors shall be taken from the outside of the exterior walls.
   - c. The area of used basement is to be measured from the same line as the outside wall of the first floor.
   - d. In figuring wall and partition areas, no door or window opening shall be deducted, but the wall shall be figured solid as though no opening occurred.
   - e. Walls and partitions are to be figured to the finished thickness, including lath and plaster.
   - f. Wardrobe and closet areas shall be figured inside the walls.
   - g. Tabulations are to be checked until the sum of the various areas check within one per cent of the total area.

3. Distribution of percentages to the various classifications of floor areas
   - a. Instruction—at least 50 per cent of floor area
     - (1) Auditorium
     - (2) Classrooms
     - (3) Gymnasium
     - (4) Kindergarten
     - (5) Library
     - (6) Practical arts
     - (7) Social studies
   - b. Administration—not more than 12 per cent of floor area
     - (1) Principal
       - (a) Private office
       - (b) Reception and clerk's room
       - (c) Book rooms
       - (d) Counselor's room
       - (e) Lavatory
       - (f) Nurse's rooms
       - (g) Storeroom—office supplies
       - (h) Storeroom—school supplies
       - (i) Vault
     - (2) Teachers
       - (a) Kitchenette
       - (b) Lavatory
       - (c) Locker room
       - (d) Rest room
     - (3) Heating and ventilating
       - (a) Boiler room
       - (b) Electrical room
       - (c) Engineer and janitors' workroom
       - (d) Lavatories
       - (e) Storage room—fuel
       - (f) Storage room—janitors' supplies
     - (4) Sanitaries
       - (a) Boys' toilets
       - (b) Girls' toilets
   - c. Stairs and corridors—not more than 20 per cent of floor area
     - (1) Corridors
     - (2) Elevators
     - (3) Fire-escape stairs
     - (4) Hallways



THE CAFETERIA



THE AUDITORIUM

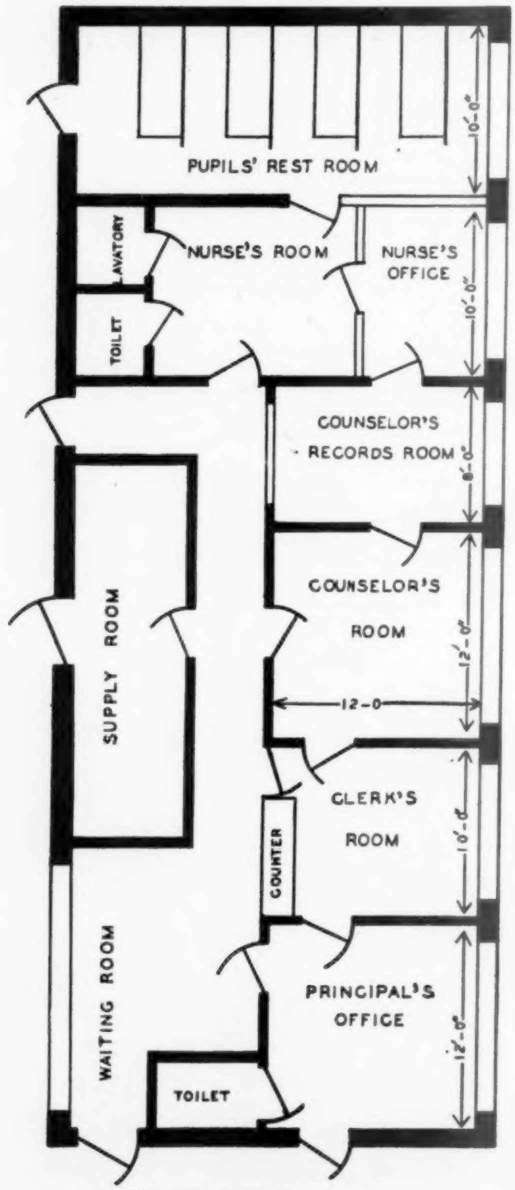
(5) Loggias
(6) Passageways
(7) Stairs
(8) Vestibules

d. Walls and partitions—not more than 10 per cent of floor area
(1) Inside partitions
(2) Outside walls

e. Accessories—not more than 8 per cent of floor area
(1) Air vents
(2) Cafeteria
(3) Chimneys
(4) Chutes—dust
(5) Chutes—waste
(6) Cloakrooms
(7) Closets
(8) Flues
(9) Lockers
(10) Lunch rooms

Elementary School-Platoon Organization Capacity 1,276 Pupils

1. *Instruction Units*—at least 50 per cent of floor area
a. Fundamentals
12 Home rooms—23'-6" x 30' x 12'
12 Bookcases—1'-6" x 4'-6" x 7'
Lockers (see accessories, item 5)
b. First Grade Units
4 Academic rooms—23'-6" x 20' x 12'
2 Activity rooms—23'-6" x 30' x 12'
c. Health
Gymnasium
1 Playroom—42'-0" x 66' x 18'
1 Boys' shower, lockers, etc.—30'-0" x 33' x 18'
1 Girls' shower—30'-0" x 33' x 18'
d. Kindergarten
1 Activity room—30'-0" x 36' x 12'
1 Bay window—4'-0" x 8' x 12'
1 Workroom—18'-0" x 26' x 12'
1 Shop—11'-6" x 12' x 12'
2 Cloakrooms—5'-0" x 8' x 12'
2 Toilets—5'-0" x 6' x 12'
e. Leisure Time
1 Art room—23'-6" x 40' x 12'
Library
1 Reading room—23'-6" x 40' x 12'
1 Workroom—11'-0" x 15' x 12'
1 Conference room—12'-0" x 15' x 12'



THE ADMINISTRATION UNIT

2 Literature rooms—23'-6" x 30' x 12'
1 Music room—23'-6" x 40' x 12'
f. Practical Arts
(1) Manual Arts
1 Workroom—23'-6" x 36' x 12'
1 Paint room—12'-0" x 18' x 12'
1 Tool and lumber room—11'-0" x 18' x 12'
(2) Homemaking
1 Cooking room—23'-6" x 30' x 12'
1 Sewing room—23'-6" x 30' x 12'
g. Social-Civic
(1) Auditorium—Capacity 500 pupils
1 Assembly room—48'-0" x 66' x 15'
2 Stages—20'-0" x 30' x 12'
2 Dressing rooms—12'-0" x 24' x 15'
1 Motion picture booth—8'-0" x 12' x 9'
a. Principal's units—1,600 sq. ft.
2 Social Studies rooms—23'-6" x 40' x 12'
Total for instruction units—31,322 sq. ft.
2. *Administration units*—not more than 12 per cent of floor area
a. Principal's units—1,600 sq. ft.
(1) Principal's office—10'-0" x 12' x 12'
(2) Principal's toilet—4'-0" x 6' x 12'
(3) Clerk's room—10'-0" x 12' x 12'
(4) Counselor's room—12'-0" x 12' x 12'
(5) Records room—8'-0" x 12' x 12'
(6) Nurse's room—10'-0" x 19' x 12'
(7) Nurse's toilet—4'-0" x 6' x 12'
(8) Nurse's storeroom—4'-0" x 4' x 12'
(9) Supply room—7'-0" x 22' x 12'
(10) Book room—23'-6" x 18' x 12'
b. Teachers' units
2 Rest rooms—15'-0" x 18' x 12'
2 Toilets—6'-0" x 8' x 12'
2 Locker rooms—8'-0" x 8' x 12'
c. Heating and ventilating
(1) Janitor's workroom—23'-6" x 15' x 12'
(2) Boiler room—23'-6" x 15' x 12'
(3) Janitor's storeroom—23'-6" x 15' x 12'
d. Sanitaries
2 Boys' toilets—23'-6" x 36' x 12'
2 Girls' toilets—23'-6" x 36' x 12'
2 Primary toilets—23'-6" x 18' x 12'
Total for administration units—8,075 sq. ft.
3. *Stairs and corridors*—not more than 20 per cent of floor area
a. Corridors—9'-6" wide
b. Stairs—44" between rails
c. Vestibules—12' to 14' wide
Total for stairs and corridors—13,520 sq. ft.
4. *Walls and partitions*—not more than 10 per cent of floor area
a. Outside walls
b. Inside walls
Total for walls and partitions—6,760 sq. ft.
5. *Accessories*—not more than 8 per cent of floor area
a. Flues
b. Vents
c. Chutes
d. Cafeteria—30' x 84' x 12'
(1) Dining-room—30' x 54' x 12'
(2) Kitchen—30' x 30' x 12'
(3) Storeroom
(4) Lavatory
(5) Office
(6) Teachers' lunch room—15' x 25' x 12'
e. Lockers—1008—12" x 12" x 3'
Total for accessories—5,400 sq. ft.

EDITORIAL NOTE.—The floor plans illustrating this article were prepared by the Division of Administrative Research of the Long Beach City Schools.

Elementary School Office Facilities

Important Considerations Frequently Overlooked by Architects and School Officials

BY HOYT D. SMITH
PRINCIPAL OF HUGUENOT SCHOOL, NEW ROCHELLE, N. Y.
and
FRANK W. HUBBARD
ASSISTANT DIRECTOR OF RESEARCH, NATIONAL EDUCATION ASSOCIATION

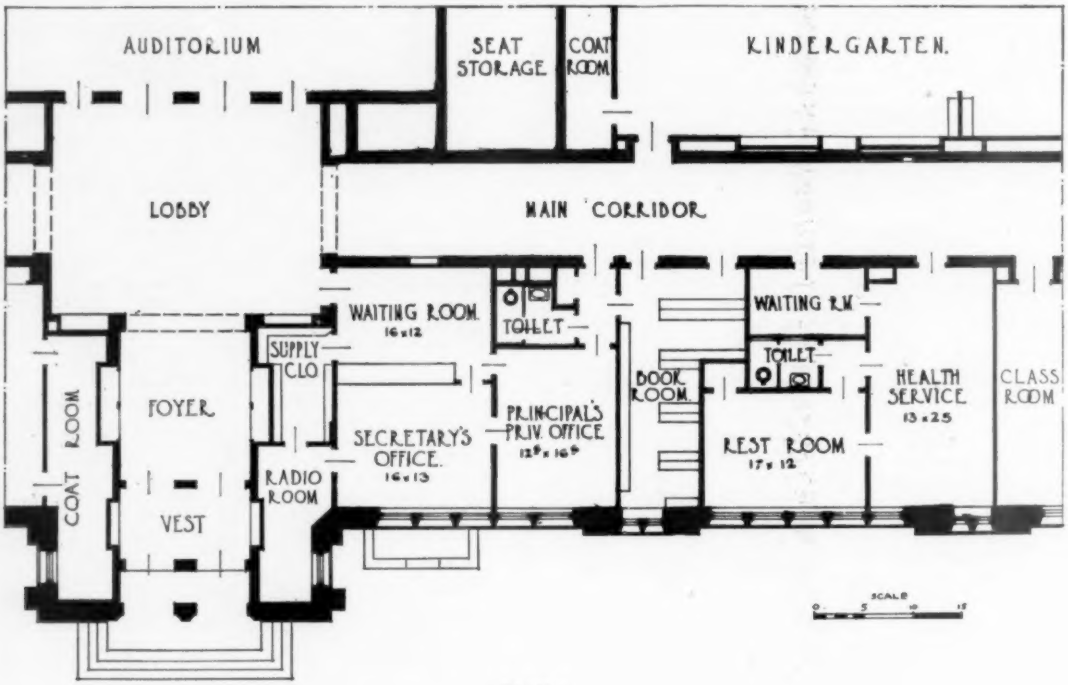
THE administration of an elementary school may be bad, indifferent, or good. Bad management hinders the teaching relationships and does much to defeat the essential purpose of the school. Indifferent administration is the "getting by" or colorless sort of program. Good management is a conscious attempt, not only to provide acceptable learning conditions, but to exert a continuously positive influence.

Much school architecture as applied to the elementary school offices is either in the bad or the indifferent stage of development. Bad offices are those placed under stairways, in cramped spaces, in inconvenient locations, or without any thought of the school's program. Indifferent offices may be adequate as to space and location, but in arrangement they contribute nothing to economical management. Such offices force the principal, his assistants, and the school program to function *around* and not *through* the office facilities.

What General Principles Should a Good Office Recognize?

First, the intelligently planned office recognizes that the elementary school of today is a complex organization. In larger schools problems arise which demand the attention of the classroom teacher, the principal, the vice-principal, the school secretary, members of the medical and health staff, the psychology department, the attendance service, and the visiting teacher. Adequate space and provisions must be made for these workers.

Second, the office must facilitate the focusing of the various above-mentioned specialists on



PLAN 1

a single problem. Our schools now are concerned with the total personal development of the child. The important thing is not to dismember the individual pupil through tests and examinations, but to *synthesize* the outcomes of such study so as to provide more fully for individual development. Specialists and their records may be so scattered in a building that the principal cannot exercise the best coordination and direction. Hence, the importance of physical facilities which make group thinking on a child's case not only possible, but relatively simple.

Should the Office Be in Separate Units or a Suite?

Business has long recognized the importance of arranging its facilities in terms of the work to be done. Serial processes are arranged in the required order. Cooperating departments are given every encouragement to work together. Such practices not only save time, money, and human energy, but they insure to the final product its share of the specialization which has been provided.

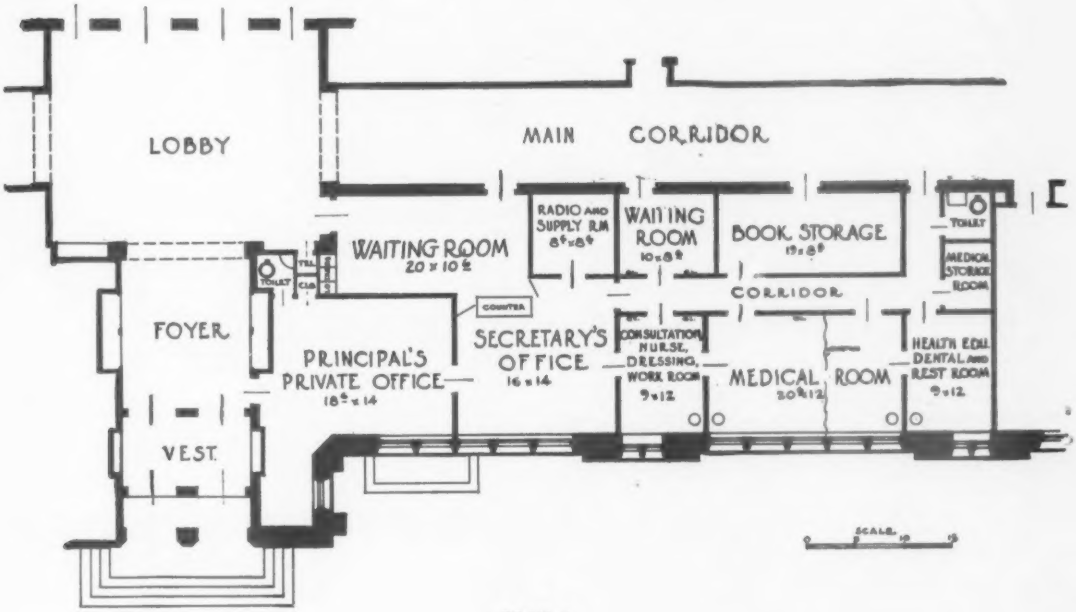
Many school buildings, particularly high schools, have been planned with the apparent assumption that each department is a separate entity which bears no important relation to the other departments. After these buildings are put into use, it is found that, even where interphones are used, there are many handicaps resulting from the isolation of offices and the maintenance of separate records in each.

Judged from the experience of a large number of school staff members, the weight of evidence is greatly in favor of the scheme of grouping offices in suites adjacent to each other. Some of the advantages gained thereby are: (a) the records are centralized and unified; (b) the principal's secretary can oversee a larger portion of the office activities; (c) the administrative and supervisory work of the school is unified; (d) there is a saving of time in passing from one office to another; (e) space is economized in that offices can more readily be used at different times for a variety of purposes; (f) it permits of greater flexibility in anticipating future modifications to meet unforeseen office needs.

How Do Newer School Office Plans Meet the Foregoing Suggestions?

Figure 1 shows an office arrangement laid out recently by persons who are unfamiliar with the principal's viewpoint. In this section we shall show why such an arrangement is inadequate for progressive school conditions.

The location of the offices indicates that they are thought of as constituting one suite. Their arrangement, however, makes them two awkward suites which, so far as travel distance is concerned, are remote from each other. Plan 2 shows how the same space might be utilized to embody the principles stated above.



PLAN 2

A Comparison of the Two Plans

Plan 1	Plan 2
The two suites are isolated by (a) the location of the book room; (b) the placement of rooms; (c) the location of doors.	Each office is easily accessible from the others. The central location of the secretary (a) gives her supervision over office activities and (b) over medical suite in the absence of medical staff members; (c) enables her to be custodian of records.
Offices cannot be used by more than three or four persons at one time without confusion.	Offices may be used by as many as six persons at one time without interference.
The book room monopolizes valuable outside window space.	Less valuable interior space with artificial lighting is adequate for a book room. It is more accessible to the secretary than in Plan 1.
To reach the book room the secretary must pass through the principal's office or travel four times this distance.	The medical room is properly given the most desirable window space.
The room called "rest room" has the most desirable window space. It is accessible through the health service room only.	Four persons may work in the medical suite simultaneously without disturbing each other.
Rooms are not suitable or convenient for varied purposes.	Rooms may readily be used for various purposes as the occasion demands.

If the above criticisms do not seem sufficiently convincing, let us consider the physical arrangement of the office as it may bear upon the welfare of children. The cases cited are not in any sense unusual, as any principal will testify. Note throughout these cases how the arrangement of Plan 1 forces the principal and others to work *against* the office facilities, while Plan 2 enables them to work *through* the offices.

CASE A

Tom Boy has fallen on the playground and cut his head. Mr. Janitor brings Tom to the Health Service room of Plan 1. There is no medical staff member present, so Miss Secretary is called to render first aid. (Note the travel distance between the two offices in Plan 1.) As the wound is bleeding profusely, she gives directions for stopping it, then runs back down the hall to her office to 'phone for Dr. School Physician. She tells Mr. Principal what has happened and they both hasten to the medical room, leaving their offices deserted. Miss Board of Education Central cannot communicate with Dr. School Physician, as he is on his way from one school to another. She tries to 'phone this information back to the school, but everyone is too far away from the office telephone to hear it ringing. (In the excitement Miss Secretary had forgotten to connect the instrument in the medical room.) Thinking it must be a serious emergency, Miss Central summons another local physician.

In the meantime Mr. Principal has decided that the injury is not serious, so sends Miss Secretary back to her office to tell Miss Central that the case can await the arrival of Dr. School Physician and to call Tom's mother to ask if she prefers to have Tom sent to their family physician for examination. Tom's mother is assured that it is a minor injury, but her imagination springs into action. She cuts off in the midst of the explanation, calls her family physician, and in a short time arrives at school in breathless excitement. The sight of two doctors bending over her blood bespattered son, with a third arriving, does not add to her tranquility.

As soon as all are assured that the injury is only slight, there is a general round of pointed remarks about the inefficiency of the school and the incompetency of some of its staff, no one realizing that this scene might have been averted if the offices had been more carefully arranged as in Plan 2.

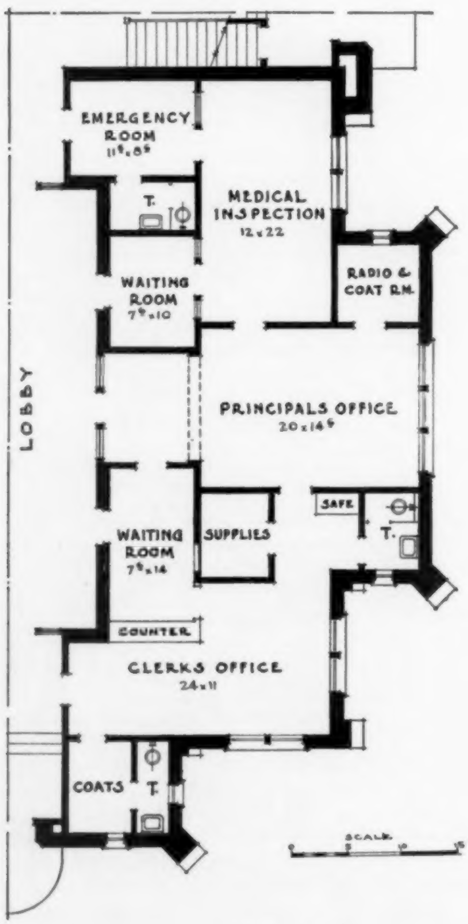
Two Other Plans Compared

Plan 3 shows another modern office suite which violates some of the principles of good office planning. Plan 4 indicates an arrangement by which it might be improved. (See page 318 for drawings and explanation.)

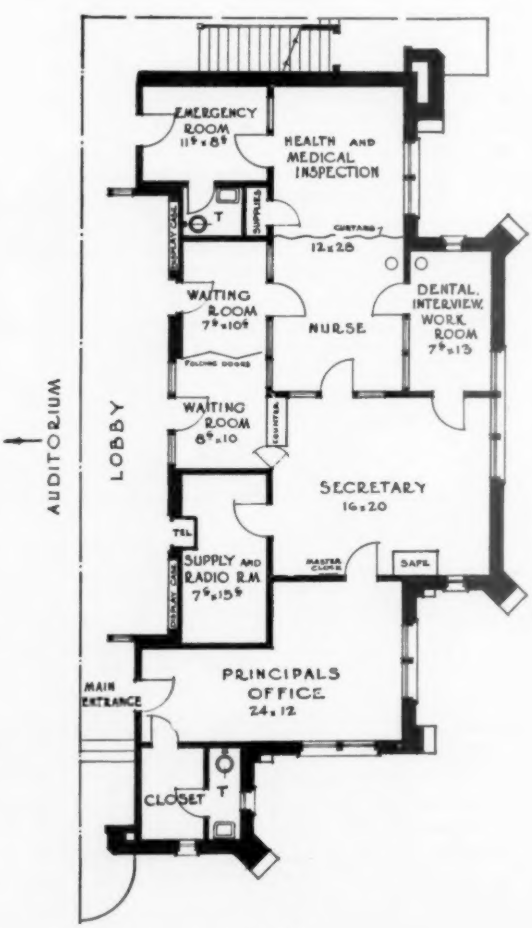
PLAN 3	PLAN 4
The principal occupies the center of the suite, where he will tend to be the central figure in mere routine matters.	Office routine will tend to center in the secretary's office.
The radio room should be under the control of the secretary, not the principal.	The radio and supply-room is out of the way, in the least valuable space, and under the control of the secretary.
Traffic between the medical room and the clerk's office will tend to take the shortest route through the principal's office.	The principal is accessible, but the secretary can prevent unnecessary interruptions.
Records cannot conveniently be centralized and unified in the secretary's office.	Records can readily be centralized in the secretary's office.
The position of the supply-room places the principal and his secretary out of speaking distance.	The waiting-rooms may be thrown together when the occasion demands it.
For esthetic reasons the three windows in the principal's office are full length, while the pairs of windows in the medical room and the clerk's office are half this height. This gives the medical room inadequate light, while the principal has more than is needed.	By lengthening the health suite to include one of the three central windows, more adequate lighting is provided.
The narrower portion of the principal's office is practically waste space.	
Although they are adjacent to outside walls, the radio room and the opposite corner are practically waste space because of inadequate light.	The outer corners, which are dark and of little use in Plan 3, are sufficiently well lighted in this plan to form useful space.
The entire outer section of the offices has little value except for external appearance.	
Not more than three or four persons can work in the suite at one time without disturbance.	Five or six persons may work simultaneously without interfering with each other.

CASE B

Mary Pupil is sent to the medical inspection room in Plan 3 by Miss Teacher with a note stating that Mary has a sore throat. Should she be allowed to remain in school? Mary finds no one there, so inquires in Miss Secretary's office. "Doctor Health is not due at our school today, but Miss Nurse should be here. Perhaps she has gone to some classroom, so go back to the medical office and wait for her, Mary." But Miss Nurse has met Mr. Principal in the corridor and told him that she has fin-



PLAN 3



PLAN 4

ished her work and is going to another school, because it's too dark in the medical room to make inspections today. At recess Miss Teacher inquires of Miss Secretary what was done with Mary Pupil. As Miss Secretary has had no report, Miss Teacher goes to the medical waiting-room and finds Mary patiently waiting. She returns with Mary to Miss Secretary and they consult Mr. Principal. He thinks Mary should go home. "But," protests Mary, "Mother was going shopping at ten and won't be home until lunch time." "Then let her lie down in the rest room until noon." Here Mary has to remain unsupervised and out of calling distance from everyone, unless another pupil is deprived of her classroom work and exposed to the danger of contagion to stay with Mary.

If the offices had been arranged according to Plan 4 the medical room would probably have been light enough for Miss Nurse to do her work. Or before leaving, she would have merely opened the door and informed Miss Secretary. Had it been necessary for Mary to remain, she could have been just the other side of the door from Miss Secretary.

Shall All Elementary Schools Have Office Suites?

By this time many careful readers will be questioning whether all communities need or can afford to provide elaborate office facilities. In general, the answer is that the extensive facilities are required if school systems build the large buildings which progressive theory suggests.* However, even in small buildings it is not asking too much that certain *foresighted* plans be made.

Just as provision must almost always be made for additions to a building to care for growth in enrolment, the construction of a building should facilitate future alterations. One need only note the inadequate construction of some of our buildings now in use to see that it is difficult to foretell what changes will occur in education which will necessitate alterations in the building. For this reason the walls separating classrooms in some of our better schools are constructed in such a manner as to be most easily modified.

To provide facilities too far in advance of the need would be an unjustifiable extravagance, but a building should be so planned that these facilities can be added in the future with a minimum of expense and alteration.

For a school which needs only a simple office at present, the following suggestions are given:

(a) It is reasonable to assume that a school which does not now have secretarial assistance for the principal, a medical staff, and psychological guidance, will add some of these facilities in the future.

(b) The future offices can be planned so that the space can be utilized temporarily for classrooms, library, laboratory, storeroom, teachers' room, or for other purposes.

(c) As the need for office space grows, sections of the classroom units can be adapted to the purpose.

(d) This flexible plan precludes the use of odd spaces for offices. There must be room for expansion, and this expansion must be provided for in the general layout of the building.

* There is some evidence to show that buildings enrolling 1,000 or more pupils offer advantages in terms of construction and maintenance and adequacy of staff. The opportunities for classifying pupils are greatly improved and a greater number of modern facilities can be provided in a large building.

Why Are Centralized and Unified Record Systems Necessary?

There is a constant danger, as staff duties become more specialized and the number of pupils increases, that each person will have at his command only a portion of the information concerning a pupil. The pupil may be so completely dismembered that he is never reassembled. Educators have much to learn from the case history technique of the large medical clinics, in which all pertinent data which will contribute to a proper diagnosis of the case are assembled and kept available under the patient's name. To serve their intended purpose, pupil records must be cumulative over the period of the pupil's school career, and they must be permanently recorded and preserved for future reference.

To be of value to teachers and staff members, they must be in a form which will be readily understandable. This implies the avoidance of technical symbols and the inclusion of a key in case a code is used.

Elaborate records lose their value, especially when it is desired to make comparisons for such purposes as classification.

There are visible index filing systems on the market which have value in simplifying record keeping and making information more readily accessible. The shallow-drawer type is widely used. The loose-leaf book style has the advantages of being more compact and portable.

The unified records should be under the control of the principal's secretary, and her office should be the office from which other offices radiate.

CASE C

Miss Teacher has reported to Mr. Principal that John Fidget is falling behind in his school work because of irregular attendance and that he is disorderly when he should be studying. Miss Secretary reported John's recent absences to Mr. Attendance Officer. The latter learned from the parents that they were unable to force John to attend school regularly, and he recommended that Mr. Principal issue a children's court complaint against John. Miss Psychologist has given John tests which indicate that he has more than average ability. Mr. Principal, after talking with John, has found a clue that there may be a physical reason for John's attitude toward school, although he seems to keep regular health habits and is normal in weight according to his health record. John was absent when the last physical examinations were made, but his previous record shows slightly defective vision.

Mr. Principal has asked Dr. School Physician to give John a thorough physical examination, which has revealed severe eye strain. Mr. Principal has written to John's parents asking that they confer with him at their earliest convenience regarding John's nervous condition and suggesting that eye strain may be partly accountable for his irregularity.

Mr. Principal has received a curt reply from Mrs. Fidget to the effect that John's nervousness is just devilishness and that they send John to school to be taught and not to be told that he has to have any more money spent on him. Anyway, if they did buy John glasses he wouldn't wear them, and if he did he would break them. Neither of John's parents wear glasses, nor did his grandparents, so he doesn't need them.

This is the point at which it will be necessary that Miss Visiting Teacher pick up the threads of the story and tactfully win the parents over to a more sympathetic understanding of John's case.

Contrast the loss of efficiency in dealing with such a case as this in offices arranged by Plan 1 or 3 as compared with the well-articulated administration made possible by Plan 2 or 4.

Summary and Recommendations

The inadequacy of most elementary schools is indicated in comparison, first, with the complexity of the modern school and its program; and, second, with the functioning of the school's specialists in relation to particular pupils or problems.

Attention in school architecture has until recently been centered upon the school building as a whole, the classroom arrangement, the auditorium, and similar phases.* The school office has not received its share of attention. Often when thought has been given to the office, little weight has been assigned to the experience of those who use the offices. Professional theory and progressive practice make the principal the coordinating leader of each school unit. Should not the workman have an interest in the kinds and use of his tools?

Architects are not wholly to blame for the present status of the school office. They have probably been given little guidance with the problem. Superintendents, and even principals, have shown indifference to office requirements. Hence, it is largely inertia that has made an inadequate office the only blemish in a building which otherwise meets all architectural and educational standards. The principles and standards offered above are not final, but they are based upon tested experience and should prove helpful in school-building planning.

* Strayer and Engelhardt: Elementary School Standards. Bureau of Publications, Teachers College, Columbia University, 1923.

Books and Pamphlets Issued by State Departments of Education with Special Reference to School-Building Planning and Construction

MANY state departments of education have been vitally concerned with the problems of planning and constructing new schoolhouses. Their interest has led to the preparation of numerous books and pamphlets in which school-housing standards are discussed and illustrated. These pamphlets also frequently include the state's requirements which must be followed in the planning of school buildings. The significant reports issued by various states in this field are listed below:

Arizona
Bulletin, 1927. Containing Educational Measures Passed by the Eighth Regular Session of the Arizona State Legislature.
Eighth Biennial Report of the State Superintendent of Public Instruction to the Governor of the State of Arizona. For the Period July 1, 1924, to June 30, 1926.

Arkansas
Four Years with the Public Schools in Arkansas, 1923-1927. A Place to Work—A Place to Play.

Connecticut
Laws Relating to the Construction of Schoolhouses—and suggestions relating thereto. Second Edition. 1926.

Delaware
Minimum Standards for School Buildings and Sites. 1927.

Idaho
Bulletin of Education. School House Plans. One-, Two- and Three-Room Buildings. June, 1927.

Illinois
Aids to Teachers and School Directors of the One-Teacher School. 1927.

Indiana
Laws and Procedure in Schoolhouse Construction.

Kansas
Details of Requirements for Standardization of Rural and Graded Schools.

Maryland
Requirements for Standard Elementary Schools. August 20, 1926.

Massachusetts
Department of Public Safety. Regulations Relating to the Erection, Alteration and Inspection of Schoolhouses.
Annual Report of the Schoolhouse Department. 1915.

Michigan
School Buildings, Equipment and Grounds: For City, Graded and Rural Agriculture School Districts. 1922.

Minnesota
Laws and Rules Governing School Buildings and Sites. June, 1928.

Missouri
Plans for School Buildings and Equipment in Missouri. 1920.

Nebraska
Rural School Standards.

New Jersey
Building Code—Comprising the Law and the Rules and Regulations of the State Board of Education Concerning Public School Buildings. July, 1925.
School-Building Survey—State of New Jersey. 1922.

New York
Rural School Buildings and Grounds: Care, Maintenance and Improvement of Rural Schools. 1927.
School Buildings and Grounds: Laws, Rules, and Information Relating to School-Building Construction. 1926.
School Buildings, Sites and School District Bonds. 1926.
School Buildings and Grounds. Volume 3 of the Eleventh Annual Report of the New York State Department of Education.

North Carolina
Schoolhouse Planning in North Carolina. Annual Report.
State School Facts.

North Dakota
General School Laws—Comprising the Laws in Force Pertaining to Public Schools. 1927.

Ohio
State Building Code. Part I—Administration. Part II—School Buildings.
Ohio High School Standards. 1929.
Standards for Rural and Village Elementary Schools.

Oklahoma
School Laws. 1927.

Pennsylvania
Rules and Regulations in Regard to Schoolhouse Construction. 1917.

South Carolina
High School Manual. 1927.

South Dakota
Blueprints of standard buildings.

Utah
School-Building Code. 1922.

Vermont
Public Schools of Vermont and Their Improvement. 1925.

See page 548 for Aids Available to Local School Boards from State Departments of Education.

Simplification of School Furniture Finishes

BY J. W. McCLINTON

EXECUTIVE SECRETARY, NATIONAL SCHOOL SUPPLY ASSOCIATION

RECENT years have produced marked changes in quality and types of school equipment. Quality rather than price is gradually coming to be the dominant factor in purchases. Pupil comfort and health, conservation of sight, supervised study, community use of school buildings, and similar movements, have created new designs and varied uses of school equipment. In this program the school industry has met every demand of the school purchaser, in many cases anticipating the demand.

Attention has been directed to simplification in all lines of industry in an effort to reduce cost of production, which automatically carries over into selling prices. This movement has served also to reduce inventory and increase service, as well as to eliminate the buyer's confusion incident to dealing with many grades, sizes and patterns.

One of the most constructive programs growing out of this movement is that of simplification of color finish for school equipment. Previously, there were as many color finishes to school equipment as there were manufacturers. Now all school equipment purchases may come within a minimum light and maximum dark range of School Furniture Brown, so that all equipment will harmonize. This situation is assured because the manufacturers responsible for 90 per cent of production have accepted the simplification program, which, after joint conferences, has been endorsed also by boards of education, superintendents and purchasing agents of educational institutions.

Matching Trim to Color of Furniture Finish

One of the most encouraging as well as beneficial features of this program, which has made its appearance from the very first, is the tendency of boards of education to match the trim of the new school building to the standard color finish. This simplifies the whole building program. Formerly, the trim of the building was selected irrespective of whether it would harmonize with the equipment. As a result, it became necessary to match a variety of furnishings to the trim. This led to a great amount of special finish jobs—which are expensive, disorganizing and a stumbling-block to efficiency in service.

It is now recognized that the finish of the trim is a simple matter, the finish of school equipment a highly technical one. Experience has demonstrated the practicability of harmonizing the trim to the equipment. Experience has likewise demonstrated the practicability of setting up a standard color finish with which all equipment should harmonize, and the program in color finish has progressed sufficiently far to prove that the past conditions which necessitated wholesale demands for special finishes in school equipment were unwarranted and uneconomical.

Certification of Color Finish

The program operates, briefly, thus: Sample panel blocks in maple, plain and quartered oak, representing School Furniture Brown, have been developed through Finishing Research Laboratory contacts by the National School Supply Association. These blocks have been furnished to all paint and varnish companies desiring to prepare formulæ for their customers. The blocks are also furnished to manufacturers and distributors of school equipment, to architects, to boards of education. Manufacturers submit their matched color finishes to the National School Supply Association for approval. Certification privileges are available to these companies that conform to the standard color finish requirements.

Proof that a manufacturer or distributor product conforms to the color finish standards may be furnished the purchaser either in the form of an official letter of approval or by the following certification form:

> We certify that the master color block with which these sample blocks are matched comes within the range limits defined as School Furniture Brown and is in accordance with Simplified Practice Recommendation No. R-111-30, United States Department of Commerce.—NATIONAL SCHOOL SUPPLY ASSOCIATION.

When boards of education specify School Furniture Brown in their equipment purchases, a manufacturer or distributor knows exactly what color finish is desired. When the manufacturers' production is on the basis of the color standard finishes, there need be no concern over matching color finish blocks; there need be no special finish jobs; there need be no unnecessary delay in production or delivery of an order.

Advantages of a Standard Basis

The board of education, superintendent and purchasing agent are relieved of the confusion of harmonizing a variety of lines of school equipment produced by different manufacturers. They are relieved of the necessity of spending time and money to develop their own standard color finish for their own school system. They are relieved of the necessity of preparing sample color finishes or otherwise attempting to define their color finish requirements when contemplating the purchase of school equipment. They have the protection of being able to purchase replacements and additional equipment, or to utilize transfer equipment

within a school system, when there is available to them a standard basis upon which they may specify their equipment requirement purchases.

The color finish program has been made possible through the cooperation of the Division of Simplified Practice of the United States Department of Commerce. Under its guidance the various preliminary conferences of manufacturers were held. It directed the joint conference of educators, architects, and manufacturers and distributors of school equipment at the conferences called for the purpose of final adoption of the proposed color finish standards. They secured the acceptances of the program from the same group.

AUTHOR'S NOTE.—There has been published a booklet, "Harmony in Color Finish of School Equipment," which gives the entire story of the project. It also carries a reproduction of the color finish in maple, and in plain and quartered oak as illustrative of the general plan. A copy of this booklet is available free of charge by addressing the Association Headquarters, 176 West Adams Street, Chicago, Ill.

Sight-Saving Classes

BY WINIFRED HATHAWAY

ASSOCIATE DIRECTOR, NATIONAL SOCIETY FOR THE PREVENTION OF BLINDNESS, NEW YORK

SIGHT-SAVING classes have been established in public and private school systems to meet the needs of two groups of pupils: the first, that for which the classes were originally intended, is composed of children with progressive eye difficulties that tend to grow worse under unfavorable conditions; the second, of children who, because of static low vision, cannot make use of the ordinary school equipment. Without special provision, children of the second group might be deprived of educational advantages, and children of the first group might join the ranks of the blind.

Proportion of Children Needing This Specialized Form of Education

The decision as to eligibility for these classes is made after everything possible has been done to correct eye defects and to cure eye diseases. Where it is possible by these means to bring the sight of children approximately to normal, work can be undertaken in the regular grade. This decision is made according to the sight of the better eye. A child blind in one eye, but with good sight in the other, is not a candidate.

The number of children needing the specialized education provided by sight-saving classes is small. The most conservative estimate is one in every thousand of the school population. In several states, however, where the work has had the benefit of long experience, the estimate is one in every five hundred of the school population. Thus, every city having a general population of 25,000, or over, will doubtless have enough children with very serious eye difficulties to warrant the establishment of sight-saving classes.

Selecting a Classroom

Effort is made to provide sight-saving class children with every facility to help them to overcome their handicap. Since the numbers are small, classes are not established in all schools, even in the most populous communities. The question of transportation is very difficult at best. To help in the solution of this problem, a centrally located building is selected, if possible one with modern equipment and a cooperative principal, who will be interested in having a class and in making it a success.

Since sight-saving class children are social beings, differing in no way from children of the regular grades, except that they do not see quite so well, they are not segregated. They form a part of the regular school system, doing work requiring close use of the eyes in the sight-saving classroom under the direction of a trained teacher, but taking part in all the oral and social activities of the regular grade. Hence, the school selected must have regular grade classes in order to facilitate the interchange of work.

If a modern building is not available, a great deal can be done to make classrooms suitable.

Natural Lighting

An east room is desirable. It provides not only the cheerfulness of the morning sun, so helpful to all children, especially to those suffering from any physical handicap, but gives a maximum of light with a minimum of glare—two of the essentials of good lighting.

Unilateral lighting, coming from windows on the left of the pupil, helps to prevent cross lights and shadows. Windows are built with bastions as narrow as possible, also to prevent shadows. The glass area should equal at least one-fifth, preferably one-fourth, of the floor area and should reach as near to the ceiling as possible, since the best light comes from the top of the window.

Direct sunlight is controlled by buff-colored translucent shades of a material that will help in diffusing it. Two shades are hung at each window, with rollers placed at the center, so that one shade may be pulled up and the other down. By this arrangement the space at the top of the window is left free and the problem of ventilation is solved in part, at least. Care is taken that there

PHOTOGRAPHS TAKEN IN SIGHT-SAVING CLASSES

1. Reading from large-type books placed on a raised desk. 2. The individual reading lesson in a sight-saving classroom. 3. In a sight-saving class everything possible is done to prevent eye strain and all are happy in doing the work suited to their needs. 4. Large, clear maps without detail are used

is no space between rollers, or at the sides of the window, thus avoiding streaks of light that may cause a most irritating glare.

Artificial Lighting

For dark days, adequate artificial illumination is provided, properly diffused and distributed. Adequate illumination is defined as that which gives from 10 to 12 foot-candles on the working plane of each child. Proper diffusion and distribution are obtained by the selection and placement of light units—the object being to produce an even illumination throughout the room. Totally enclosed translucent globes of low brilliance are recommended, since they diffuse the light and are easy to keep clean.

For adequate illumination for dark days, a classroom 24 x 32 x 12½ requires six lighting units, hung in two rows, approximately 1½ feet from the ceiling, 6 feet from the walls, 12 feet apart crosswise, and 10 feet apart lengthwise. Each unit should contain a 300-watt lamp. It is recommended that the rows of lights be put on different switches, since often only those children sitting on the side of the room farthest from the windows need the added light. Daylight glass globes help to produce an artificial illumination that blends well with daylight.

Decoration and Equipment of Room

Light buff walls and white or cream ceilings give good reflective values. In very warm climates, fairly light green walls are satisfactory. The woodwork is in a neutral tone to match the furniture, neutral green or brown, and everything in the room is finished in dull surface to prevent glare.

Movable, adjustable seats are supplied in dull

finish, in order that they may be moved to any part of the room where the pupil may obtain the best light. Desks lift to an angle so that no child will be required to bend over a flat surface. Seats are arranged at an angle slightly away from the window, so that the light will not fall horizontally across the working plane and cause high lights and shadows, but come from over the left shoulder. This arrangement also helps to prevent a glare from the front window in the eyes of the children sitting in the back of the room.

Blackboards—Special Material

Blackboards are of good slate and are kept as nearly black as possible by proper cleaning, and refinishing when necessary. Light yellow chalk is used, since yellow on black is believed to be more legible than white on black. No board is placed nearer than 7 feet to a window, in order to prevent glare.

All the equipment thus suggested differs in no wise from provisions that should be made for every child. Special equipment is, however, adapted to the needs of sight-saving class children. Equipment used by sight-saving class children is much larger on the whole than that used in the ordinary grade. Hence, it is necessary to have more adequate closet space than is usually provided.

Books are supplied in 24-point clear type, printed on buff-colored paper. Large writing is done on manila paper, which is sometimes lined in green for the younger children. Heavily leaded pencils and special broad-pointed pens are used so that letters and figures will be very distinct and easily read. Maps have no confusing details. They are chiefly in outline, yellow on black. But one geography project is carried on by the children at a time on the map. The sand table and other devices that rest the eyes are used for much project work.

The Teacher

These classes are conducted by trained teachers who understand enough of the various eye difficulties from which the children are suffering to adapt the regular school curriculum to their needs. The teachers are given the help of supervising oculists in determining how much close eye work each child shall undertake. Pedagogical supervision is also arranged to care for administrative, organization and curriculum problems.

In general the regular school curriculum is followed and children are kept to normal standards. For subjects requiring too long or too intensive use of the eyes, substitutions are made. Modeling with various media, free-hand cutting and sand table project work take the place of sewing, painting, drawing and other subjects that may cause eyestrain.

Typewriting is taught as early as possible in school life, never as a means of earning a living, but as a medium of expression. Naturally, the touch system is used, and in order that these children may have no eyestrain in reading what they have written, special typewriters are provided with large, clear type.

The child's eye condition must always be kept in mind. This requires individual attention and usually individual instruction. In addition, the teacher will have several grades represented. Hence, she is able to care adequately for a much smaller number of children than are usually found in regular grades. Experience indicates that 16 is the maximum number of children who can be cared for in a sight-saving class representing not more than four grades.

State and County Cooperation

Since the state makes education obligatory, it should naturally assume its share of the responsibility of providing education in a form that can be assimilated. This is being done in most of the states that have had considerable experience in this work, some making a per capita appropriation to meet all, or part, of the excess cost, others providing a sum to meet part of the salary of the special teacher, still others appropriating a sum to be apportioned by state directors charged with providing educational facilities for these children.

To meet the needs of rural children with seriously defective vision, county classes are sometimes established in a consolidated school offering the best facilities for transportation. In other cases rural children may be boarded in a city where such classes have been established. If neither of these possibilities is available, teachers of rural schools having such children under their care may be given special help. Some states include in their traveling libraries large-type books which may be sent out to rural districts.

The majority of the states carrying on this type of work are now requiring special training for teachers, hence a number of teacher training institutes are offering courses either in the school year, or during summer sessions.

Growth of Classes and Justification of Their Establishment

From the establishment of the first sight-saving class in Boston, April, 1913, the work has grown slowly, but steadily. At the close of the year 1929 there were 350 classes, representing 21 states and 95 cities.

Any such type of specialized education is expected to justify its right to exist. Under the favorable conditions afforded by sight-saving classes, about 2 per cent of the pupils are able to return to regular grade work. Education is made possible for children with static low vision who might otherwise be deprived of educational advantages. Most important of all, some children are prevented from becoming blind.

The state benefits in receiving a justifiable return for its outlay in citizens who are assets rather than liabilities to the community.

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137. A WORLD UNSEEN—Tiny Organisms Under the Microscope.
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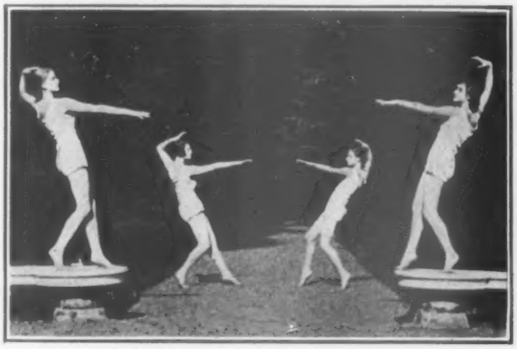

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102. The History of a Hedgehog
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105. A Rush for Diamonds
108. An African Elephant Hunt
110. Animals of the Malayan Peninsula
111. Where Tea Is King
112. The Insects That Invade Man's Dominions.
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115. Shrewd Plants
117. The Blood Stream
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121. Star-gazing
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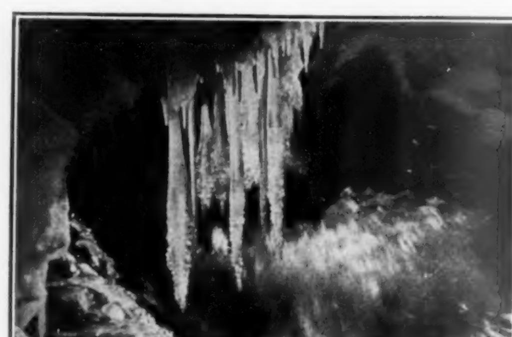
126. When Winter Comes
127. Flood-plains of the Danube
130. Mother-love Among the Lower Animals
132. Microscopic Invertebrates
134. Liquid Fire
136. Nesting Habits
139. Bosom Friendships
140. The School for Birdmen
141. The Circle of Life
142. Life's Tragedy



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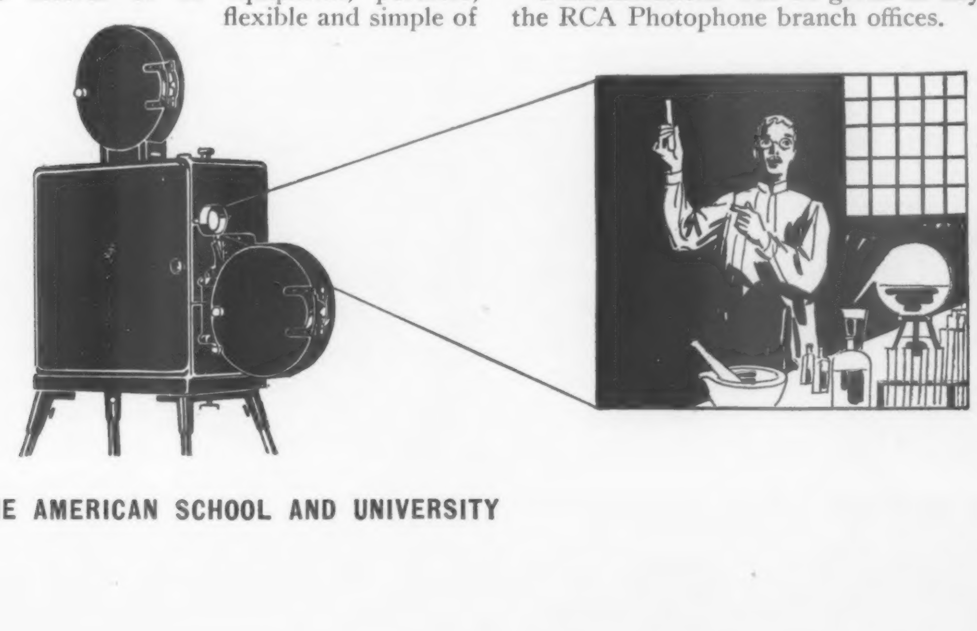

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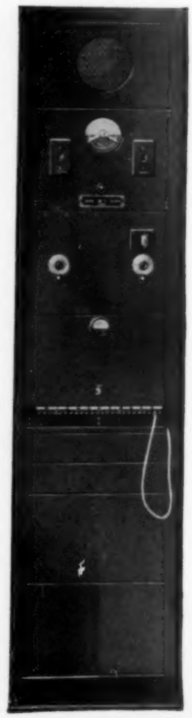

The operation of RCA Centralized Radio Equipment is very simple. The incoming program is relayed to the various parts of the building by simply "plugging in" on the lower section of the board

Every part of the RCA Centralized System; every unit; every piece of apparatus has been painstakingly planned to assure absolutely satisfactory operation.

Briefly, the equipment consists of radio receiving apparatus, power devices for supplying and controlling the various voltages from the lighting current, powerful amplifying apparatus and a control panel or switchboard that makes it possible to send the incoming program to any or all parts of the building.

One receiver with its amplifying equipment, distribution and outlet equipment constitutes one "channel." One channel is required for the reception of one program. Provision can be made for as many as four channels in order that each classroom may choose any one of four programs.

The distribution is so arranged as to render the most reliable service with a minimum of attention on the part of the operator. No batteries or charging are necessary as the apparatus is built for lighting circuit operation.

Each classroom has its own RCA Loudspeaker enclosed in a metal box and built into the wall. This loudspeaker, neat and unobtrusive, has the volume control and channel selector mounted on immediately beneath the speaker opening. When the loudspeaker is installed above reach, these controls are located at a height suitable for easy adjustment.

By merely turning the volume control, you can either lessen or increase the volume of the incoming program. By adjusting the station selector knob, you can have

A typical RCA Loudspeaker for Centralized Equipment. One of these is built into the wall in each classroom

whichever program you prefer—provided, of course, that the loudspeaker is "fed" by two or more channels.

A special phonograph unit with magnetic pick-up and induction disc motor-driven turn-table for records can be included in the installation if desired. The unit is self-contained, portable, and can be used attached to the central control panel or conveniently located upon a table.

Further details and information may be obtained by writing to the nearest RCA district office.

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The control cabinet is of the floor type and houses both the radio receiver and the phonograph.

The loudspeaker cabinet will harmonize with the furnishings of any room where it is likely to be employed. It is finished in antique ivory; the loudspeaker opening is covered by a screen whose fine mesh is the color of old gold.

Complete details will be sent to school authorities upon request. Please address the nearest office of the RCA Victor Company, Inc., stating the form of lighting current available in your buildings.

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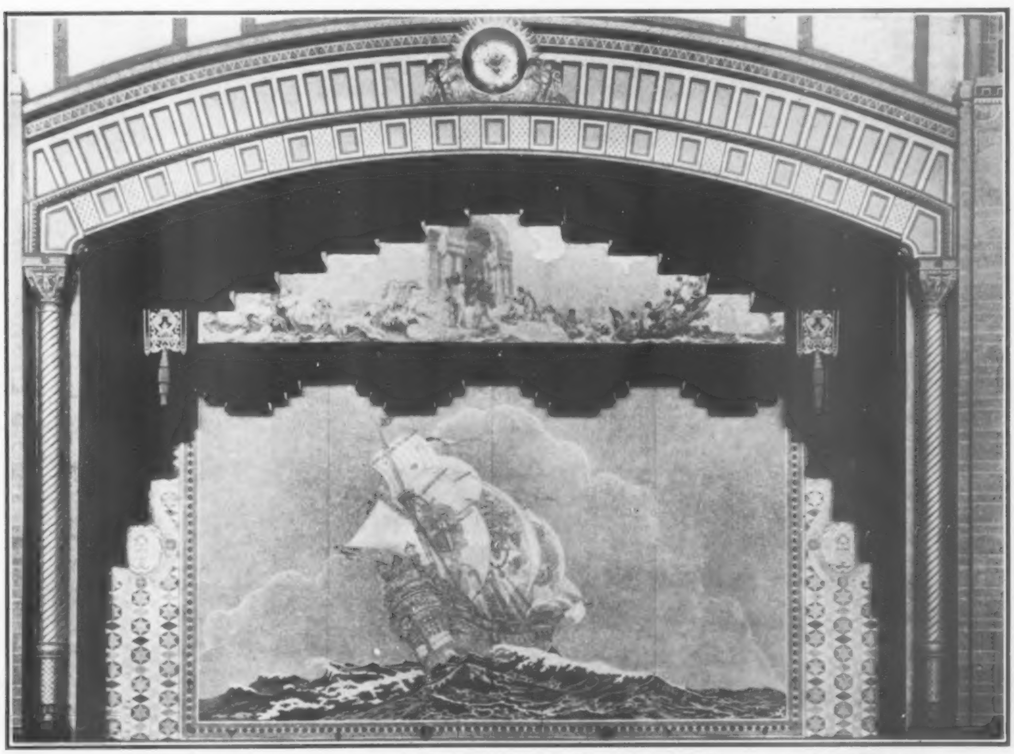

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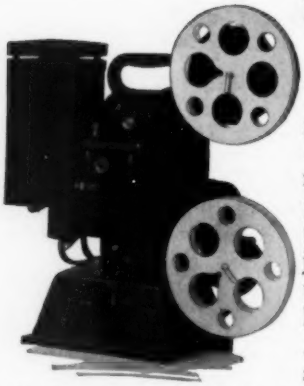

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SUBSIDIARY OF EASTMAN KODAK COMPANY

Producers of Eastman Classroom Films

Rochester, New York

Eastman Classroom Films represent the work of a staff of practical teachers, editorial writers and photographic technicians, backed by the photographic experience and research facilities of the Eastman Kodak Company. Through this fortunate combination Eastman Teaching Films, Inc., is able to offer the schools carefully and scientifically planned classroom films at a moderate price.

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In **"Simple Machines"** the graphic power of the motion picture is used to utmost advantage in demonstrating the following facts, and many more: driving an airplane is like drilling a hole. The man who moves a massive beam with a crowbar, thus illustrating the principle of lever-fulcrum-resistance, has that same mechanical triplet in his own arm, in the form of bone and muscle. The tongue of a steam shovel, the cutter of a milling machine and the prow of a swift coast guard chaser are all examples of the same device—the wedge. The old well and the modern crane hold an astonishing kinship in their common employment of the wheel-and-axle.

Only a small percentage of American school children live within reach of the great automobile plants of Michigan, Indiana and Ohio. Yet, by means of the film **"The Automobile,"** millions of pupils can see how cars are made. They can do **more.** Without leaving the classroom, they can not only visit an automobile plant, but also make rapid side trips to a Malaysian rubber plantation . . . an Akron tire factory . . . a plate glass plant . . . a refinery whence comes the gasoline that drives the car.

A day actually spent in a coal mine could not give pupils such a well-rounded idea of the way in which our chief fuel is obtained, as may be derived from the film **"Anthracite Coal."** The miner is shown on the screen as he comes to work. He dons his working clothes, his safety lamp. He rides down the shaft on a curious inclined railway, and through staunchly shored passages to his gallery. He prepares a blast and sets it off. The loosened coal is loaded into cars, hauled away by a mule, dumped. Presently it emerges from the shaft in another car and is hauled up into the "breaker." It is culled, broken, graded, washed, dumped into chutes, thence into long trains of railroad gondolas. These, and many other scenes, pass before the pupils' eyes. Eventually the miner comes up the shaft. He has spent a long day below, but the children have been given the whole story **in fifteen minutes.**

"A Descriptive List of Eastman Classroom Films" gives brief outlines of almost one hundred films now available on the subjects of General Science, Geography and Health. Write for your free copy.

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Philadelphia, Pa., 123 S. Broad Street
Pittsburgh, Pa., 2103-24 Koppers Bldg.
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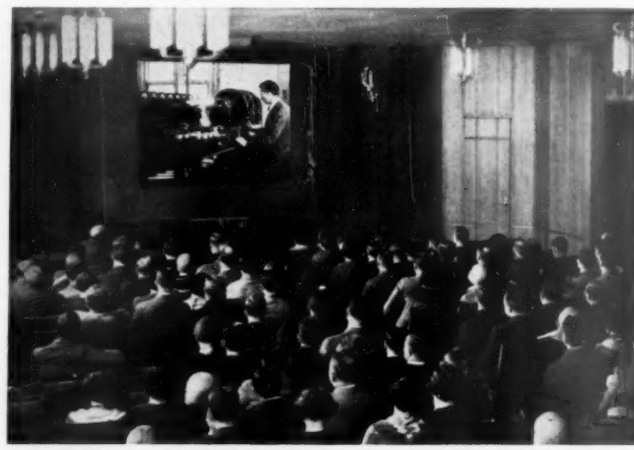
Washington, D. C., 1435 G Street N. W.
Detroit, Mich., 2111 Woodward Avenue
Cincinnati, Ohio, Enquirer Bldg., 617 Vine Street
Atlanta, Ga., 434-454-B Hurt Bldg.
Los Angeles, Calif., 7048 Hollywood Blvd.
Buffalo, N. Y., 369 Main Street
San Francisco, Calif., Crocker First Natl. Bank Bldg., 1 Montgomery Street
Chicago, Ill., 910 S. Michigan Avenue
Portland, Ore., 446 Morrison Street
Seattle, Wash., 458-9 Skinner Bldg., 1326 Fifth Avenue

Plans for Schools Now Include Talking Pictures

Desiring to keep well abreast of present-day educational developments, forward looking school superintendents, architects and others responsible for school design are turning their attention to talking pictures. They are giving this medium serious thought. Buildings are under consideration which are equipped with facilities for reproducing talking pictures as a regular part of classroom instruction. The development which makes such instruction possible in school buildings old and new is the manufacture by Western Electric of portable talking picture equipment.



Talking Pictures Are Now Being Shown to Educational and Other Organizations on the Western Electric Portable Talking Picture System

The success of educational talking pictures is due also to the fact that vivid realistic films are being made that help teachers to **teach**—in the most practical sense of the word. After the demonstration of talking pictures at the Atlantic City convention of the Department of Superintendence—an occasion where 4000 educators saw and heard audible films—there was widespread enthusiasm expressed not only for performance of the equipment but for character of the films, not only for the vast possibilities of the medium but for its present achievement.

The Western Electric Portable Talking Picture System

This equipment is designed by Bell telephone engineers and made to the high standards for which Western Electric is known as the maker of the nation's telephones and as a pioneer in the field of sound transmission.

The Western Electric Portable Talking Picture System consists of four major pieces of apparatus: projector, amplifier, horn and screen. These are packed in four specially designed and wired trunks for easy transportation from place to place.

A Comprehensive Research Program Based on Sound Educational Principles

The Research Department of this organization is cooperating with educators and working along broad lines to supervise the development of this new and growing force in teaching.

The research starts with the selection of subjects for units of instruction. And here the program starts at the very beginning by selecting the master classroom teachers who are to furnish the subject matter for the talking picture.

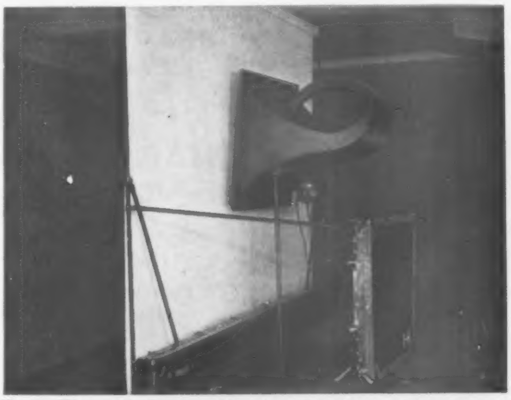
Group judgment rather than individual judgment is brought to bear in this selection. The research problem calls for a committee of educational experts from each section of the country to evaluate the work of classroom teachers who have been chosen because of their outstanding work in preparing courses of study now in general use.

After the selection of the subject matter the text is submitted to a Development Manager who examines it from the standpoint of practical picture production and turns it over to a scenario writer experienced in the non-theatrical talking picture field.

Plans call for the approval of the scenario by the Research Department expert in charge of the field for which it is being prepared, involving conferences with the scenario writer until the final approval is secured. These specialists were selected from the educational field, and represent Elementary Education, Secondary Education, Teacher Training and College and University Education.

Interior View of Western Electric Portable Projector. Operating Parts and Film Are Within Finger Length Reach

The Development Manager supervises actual production which is followed by a review of film before release and a testing program to determine the film's actual teaching practicability before it is distributed for use.



Rear View of Screen Showing Position of Horn and Receiving Unit When Assembled on Rod Supports, Ready for Use

Films are being prepared for the elementary, junior high school and high school fields in the following subjects: Physical Science, Social Science, Physical Education and Health, Vocational Guidance, Literature and Drama, Music and Art. These films are to present materials for the enrichment of the curriculum, instructional materials in specific subject matter and previews of new fields for the purpose of arousing pupil interests and activities.

Scenarios are also being prepared in the field of teacher training. These pictures are designed to present objectively classroom teaching situations for study by teachers in training and in service.

The program includes the supplying of supplementary material prepared by the teachers who furnished the subject matter of the unit of instruction. Manuals of instruction are also to be supplied for use in presenting the pictures to classroom groups. These are to be prepared by teachers trained in this work.

Service

Electrical Research Products Inc., maintain service engineers at 151 points located throughout the U. S. These men are available on short notice to maintain the quality of sound at the highest level, to care for the equipment at periodic intervals, and to respond to emergency calls.

WESTERN ELECTRIC COMPANY

New York, N. Y.

Distributor in the United States

GRAYBAR ELECTRIC COMPANY

Graybar Building, New York, N. Y.

Distributor for Canada and Newfoundland

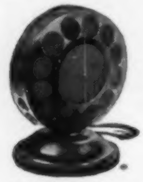
NORTHERN ELECTRIC COMPANY, LIMITED

Plant and General Offices: 121 Shearer Street, Montreal, Que.

Western Electric PUBLIC ADDRESS AND MUSIC REPRODUCTION SYSTEM

General

The Western Electric Public Address and Music Reproduction System amplifies, reproduces, and distributes speech and music to an audience of any size in room or auditorium—or to various parts of a building.



A Microphone Picks up the Sound

Developed by Bell Telephone Laboratories for the Western Electric Co., this system has steadily increased its scope of educational and commercial usefulness.

Men who plan modern school buildings are including this equipment in their specifications.

Modern School Systems Find This Equipment Invaluable

Public Address and Music Reproduction System

The essential parts of this equipment are:

(1) One or more microphones for "picking up" sound
(2) The Western Electric Music Reproducer Set, if recorded entertainment is desired
(3) A receiving unit, if radio programs are to be reproduced
(4) "Mixing" and control panels
(5) Amplifying apparatus
(6) Observer's communicating system for auditoriums
(7) Receivers and projectors or loud-speakers
(8) Necessary wiring and circuits

By using microphones and a selective system, school announcements and instructions may be simultaneously delivered to as many classrooms and to as many students as required. In conjunction with the Western Electric Music Reproducer Set, the Public Address System can be operated with standard laterally-cut phonograph records at low cost. In conjunction with a receiving unit, radio programs may be reproduced with original effectiveness.

Uses in Schools

1. Transmitting fire drill instructions
2. Conveying a general order to all rooms at once.
3. Transmitting music from the auditorium or from a music teacher to one or more rooms as desired
4. Transmitting gymnasium instructor's commands to all rooms at once
5. Conveying a visitor's, or a special instructor's speech to all parts of the building
6. Receiving and transmitting educational radio programs to all rooms
7. Supplying recorded music from the reproducer for Music Appreciation courses at any time or to any room that fits your schedule
8. Amplifying speaker's voice in auditorium, particularly important for children's weak voices

This Music Reproducer Set is Always Ready to Reproduce a Program of Recorded Entertainment or Instruction

A Graphic Interpretation of the Manner in Which the Public Address System Unites all Classrooms into One

Schools and Colleges Equipped with Western Electric Public Address Systems

College of the City of New York, Brooklyn, N. Y.
Huntington Beach Elementary School, Huntington Beach, Cal.
Seminary of the Immaculate Conception, Huntington, L. I.
Carnegie Institute of Technology, Pittsburgh, Pa.
Columbia University, New York, N. Y.
Georgia Institute of Technology, Atlanta, Ga.
Long Beach High School, Long Beach, L. I.
Erasmus Hall, Brooklyn, N. Y.
Pennsylvania State College, Harrisburg, Pa.
Whittier State School, Whittier, Cal.
University of California, Berkeley, Cal.
Yale University, New Haven, Conn.
Lehigh University, Bethlehem, Pa.
Bloomington Public School, Bloomington, Ind.
Jefferson Davis Public School, New Orleans, La.
Frank Wiggins Trade School, Los Angeles, Cal.
Richmond City School Board, Richmond, Va.
Drexel Institute, Philadelphia, Pa.
Western Kentucky State Normal School, Bowling Green, Ky.
Syracuse University, Syracuse, N. Y.
New Jersey State College of Agriculture, New Brunswick, N. J.
Leland Stanford University, Palo Alto, Cal.
Burdett College, Boston, Mass.
St. Ignatius High School, San Francisco, Cal.

(For a list of additional installations see page 301, 1929-30 edition, of this yearbook.)

Cost

The cost of a Public Address System installation is relatively small, considered in the light of its variety of uses—and of the profitable returns direct and indirect from those uses.

In estimating the cost of installation, individual requirements must be considered. Full information, including expert engineering advice, gladly given on application.

Guarantee

The Public Address and Music Reproduction System was developed and perfected by the Bell Telephone Laboratories which are the research laboratories of the American Telephone and Telegraph Company and the Western Electric Company. Thus the system represents the last word in electrical development as applied to sound transmission. The quality of workmanship is guaranteed by Western Electric Company which has manufactured equipment for the Bell System for over 50 years.

Service

Western Electric maintains an emergency stock of repair parts at strategic locations throughout the country.

Testing the Hearing of Pupils with Western Electric No. 4-A Audiometer

Audiometers

Lagging in their class work is often caused by physical defects of the students and in a great many cases defective hearing is the unrecognized cause.

The Western Electric No. 4-A Audiometer measures accurately and quickly acuity of hearing, and uses the same standard of measurement for all examined. This instrument is essentially a phonograph to which has been added telephonic apparatus so that the sounds produced in the phonograph are transmitted to the ears of those under examination.

C. S. HAMMOND & COMPANY, INC.

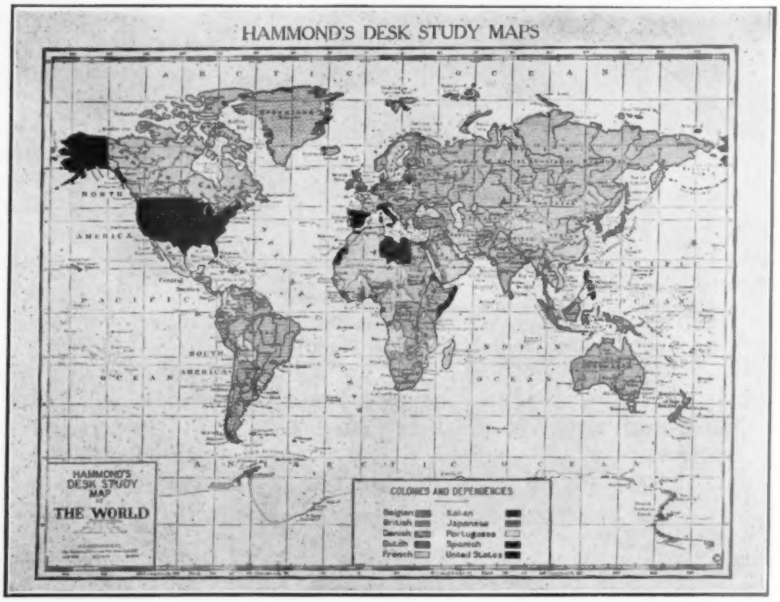
Map Engravers, Printers and Publishers since 1900

NEW YORK BROOKLYN BOSTON

General Offices and Manufacturing Department

360 Furman Street, Brooklyn, N. Y.

HAMMOND'S DESK STUDY MAPS



These maps, 8½ x 11 inches in size, are printed in full colors on five-ply cardboard with Study Helps and Suggestions on the reverse side. The maps are reproductions on smaller scale of a well edited series of wall maps, thereby making in reality a wall map on each pupil's desk. The maps show political subdivisions in colors, railroads, steamship routes with distances, principal cities and towns.

Their use insures the *active* participation of every member of the class. Instead of one pupil pointing out the geographical features on a wall map, all the children simultaneously do the work and secure the benefit of this visual instruction. The maps are serviceable, too, in reading travel stories, geographical readers and historical works, and in following current events. Using these Desk Study Maps to supplement so many different studies has an added advantage in teaching the pupils that maps are guides and that they do not pertain exclusively to geography.

For tracing and for work on outline maps, the Desk Study Maps are vastly superior to the maps in the text books because they lie flat and occupy less space.

The Study Helps and Suggestions

These Desk Study Maps are unique in that they present more than mere facts—the Study Helps and Suggestions printed on the back of the card stimulate the initiative, guiding the thought and encouraging map reading. This material has been especially compiled to conform with modern methods of teaching by Dr. Stephen B. Gilhuly of the Newark, New Jersey, Schools and Miss Matilda Frank, a member of the New Jersey State Monograph Committee on Geography. They have prepared these data along lines that they have found exceedingly productive of results in the class room.

Desk Maps Are Inexpensive

These handy, attractive and durable cards are more economical to use than an expensive and cumbersome book. An entire class can be equipped at but small cost and on account of the heavy cardboard on which they are printed, the maps will far outlast those in the text book. In fact, the use of the Desk Study Maps prolongs the life of the text books. Furthermore, the question of replacements because of geographical changes is solved economically by these Desk Study Maps. Maps become obsolete quickly in the rapidly changing world in which we live, and down to date maps can be secured from time to time at a fraction of the cost of new text books.

MAPS IN THE SERIES

Each 8½" x 11"

1. World on Gall's Sterographic Projection
2. Eastern Hemisphere
3. Western Hemisphere
4. Northern Hemisphere showing Air Communications
5. North America
6. United States
7. Canada
8. West Indies and Central America
9. South America
10. Europe
11. Asia
12. Africa
13. Australia
14. Pacific Ocean
15. New York
16. Pennsylvania
17. New Jersey

PRICE....TEN CENTS EACH

HAMMOND'S SCHOOL GLOBES

This new line of globes possesses several points of superiority over all others. One of these is the mechanical construction which reduces to a minimum the chance of breakage, and makes economical repairs possible, should the sphere become dented or scratched. This means economy for the schools because the old-fashioned spheres made of plaster are frequently broken or irreparably dented.

Our spheres are perfectly formed of a thick shell of metal reinforced along the equator by a heavy metal disc. If the shell receives an injury due to a heavy fall, we can press it back to its original shape at little cost.

All of our globes are covered with beautifully colored maps, down to date in every respect and showing the latest changes in international boundaries. They are lithographed in ten oil colors that will not fade, and, after being mounted on the globe balls, the entire surface is covered with high grade varnish. This adds a permanent and attractive lustre to the bright colors of the map and permits the surface to be washed whenever it becomes soiled.

The globes are handsomely mounted on metal or wooden stands, either in plain style, or with fixed or movable meridians.

Every globe is furnished with a metal time dial, placed at the North Pole. It marks the hours of the day. By revolving the dial, it is possible to learn instantly the time at any part of the world.

An illustrated handbook accompanies each globe. It tells how the globe may be used and is especially helpful in teaching the children the many facts it portrays and proves.

The New Nine-Inch Globe

This new size globe is being introduced in America by us. The size has been popular in Europe, because it escapes the bulk of the twelve-inch sphere yet gives appreciably more map area than the standard eight-inch size, for the one-inch increase in diameter means more than a three-inch increase in circumference.

SEND FOR CATALOG AND SCHOOL PRICES

Hammond Metal Globes Are Made With Nine- and Twelve-Inch Spheres

TERRELL'S EQUIPMENT COMPANY

STEEL STORAGE EQUIPMENT

STORAGE CABINETS — WARDROBES
LOCKERS — SHELVING

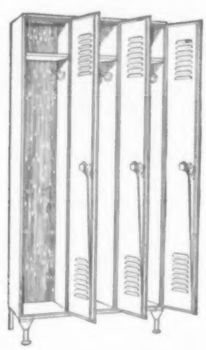
Grand Rapids, Michigan

STORAGE CABINETS

Books, records, supplies, stationery—material too valuable to be left unprotected on open shelves—can best be stored in Terrell Steel Cabinets, behind the protection of locked, steel doors, away from the eyes of the curious, safe from petty pilfering, free from dust and rodents.

Made of heavy, high-grade furniture steel, Terrell Cabinets are rigidly built to assure a lifetime of service. They do not wear out, depreciate or get out of order.

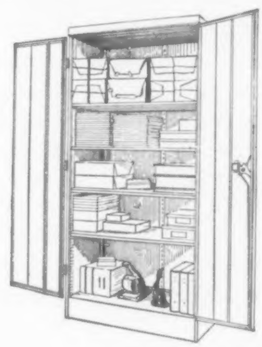
LOCKERS



SHELVING

Terrell's Library Type Steel Shelving has been especially designed for book storage in libraries, colleges and schools. Years of experience in the design and manufacture of heavy-duty steel shelving for commercial purposes have enabled us to incorporate in steel book shelving many features and improvements. The result is a light, easily handled, quickly adjustable steel shelving, built on the unit principle, which may be added to, rearranged or moved without special tools.

STORAGE CABINETS

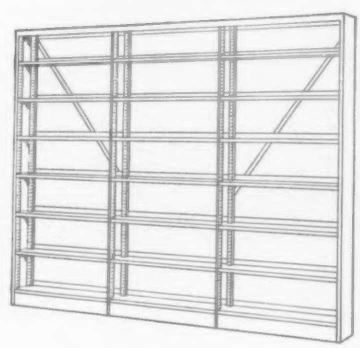


LOCKERS

Terrell's Steel Lockers give permanent satisfaction. They are strongly built of heavy steel, capable of withstanding abuse, and remain in perfect operating condition without constant attention. Attractive in design and appearance, Terrell Lockers are preferred where quality is considered.

Terrell's Lockers are made in a variety of sizes and styles and are adaptable to every purpose. Especially suitable for colleges, schools and gymnasia, where space is limited and a large number must be accommodated.

SHELVING



PENN ART CRAYON COMPANY

385 William St., Easton, Penna.

CALX Scratchless Crayon

Probably everyone who has ever been in a schoolroom has had his nerves rasped by the grating and squeaking of a piece of crayon against a blackboard. No doubt he has also seen much gray, indistinct writing on blackboards, which has meant serious eyestrain for some of the children and has probably been the cause of considerable inattention on the part of many of the others!

Grittiness and grayness in blackboard writing can be eliminated by proper care in manufacture of crayons and the use of proper materials. A very high percentage of chalk must be used, and all grit and other foreign matter and impurities removed by the washing and precipitating process.

Also, the binding ingredient must be greaseless. Greasy materials used as a binder in most brands of crayon adhere to the blackboard, coating it with a gray film which destroys its usefulness. CALX Crayons are as nearly greaseless as it is possible to make them.

Not only are CALX Scratchless Crayons gritless and scratchless and greaseless, making a clear, broad, white mark for all to see, but they have the added advantage of being as nearly dustless as is possible. The dust, instead of filling the air and causing coughing and unpleasantness, simply drops.

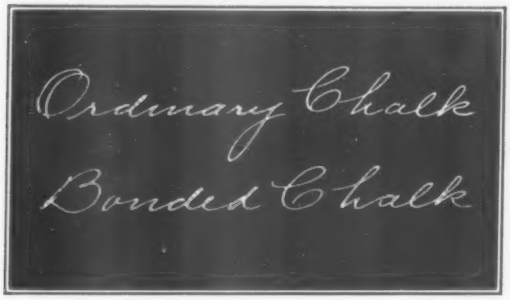
Colored Drawing Crayons

"Favoral"—This is the trade name of our waxed colored crayon for drawing on paper or fabric, available in a variety of clear, brilliant colors. Try the simple experiment of filling in an inch square with one of these **"Favoral"** colored crayons; then fill in a second square with any other waxed crayon. Note the soft, smooth, easy drawing of the **"Favoral."** Also try blending several colors. You will be pleased at the result.

"Hard Pressed" Crayon—The name of this crayon tells the story. Subjected to unusually hard pressure, this crayon is extremely durable, makes an exceptionally smooth, even mark that does not easily rub off, and when used with other colors, blends remarkably well.

CALX
SCRATCHLESS
GREASELESS
DUSTLESS
CRAYONS

Bonded Chalk



Write a few words with your present chalk. Below it, write a few words with BONDED. Note what a broad, smooth, bright, white mark you get with BONDED—yet it is hard and long-wearing.

Erase the words written with your chalk. The first stroke of the eraser will probably smear without destroying the outlines of the words. The first stroke, however, will usually completely and cleanly remove BONDED CHALK.

Examine the board carefully from an oblique angle so you get the light reflected from the board. Dark outlines of the words written with your chalk are still visible, but no trace remains of the words written with BONDED CHALK.

The dark outlines from your chalk are due to the use of soap, wax, gum or glue as a binder. In a few years your boards will have to be resurfaced to remove this accumulation and restore them to first-class condition. In BONDED CHALK (and all of our other chalks) we use a new greaseless binder, developed after 18 years of research work in our own laboratories. It leaves no destructive film on the blackboard.

Our folder "The Black Ghost in Your Chalk" tells more about this simple test. Write for a copy and for samples of our chalks.

All of our chalks are covered by our guarantee to contain no soaps, waxes, gums or glues.

Guarantee

To Whom It May Concern:

We, the undersigned, owners of the Penn Art Crayon Company of Easton, Pennsylvania, do hereby agree to pay the sum of One Thousand Dollars ($1000) to any person who shall find any trace of soaps, waxes, gums or glues in any piece of chalk, made by us and sold under our label.

PROVIDED, that any such piece of chalk claimed to contain soaps, waxes, gums or glues, shall be analyzed by three chemists, agreed upon between ourselves and the party making the claim, and all of whom shall certify to the presence of soaps, waxes, gums or glues.

Penn Art Crayon Company

[Seal] WILLIAM WASHEIM
HENRY WASHEIM

Crayon Specialists

We are manufacturers of crayons exclusively. Whether you wish our CALX or BONDED grades which are the best obtainable, or desire a medium or inexpensive grade of crayon we can supply your needs economically. Write us for samples and quotations.

L C SMITH & CORONA TYPEWRITERS INC

SCHOOL DEPARTMENT—SYRACUSE, NEW YORK

HOME OFFICE

51 Madison Avenue, New York

Special Typewriter Type Now Available for Sight-Saving Classes

Typewriting, of course, is taught as early as possible in the school life of the visually handicapped child—not merely as a possible means of his earning his living in the future (though this possibility is well worth considering), but mainly so that the child can express himself on paper in the most legible, accurate manner.

In order that the children in sight-saving classes may have no eyestrain in reading what they have written on their typewriters, up-to-date schools are now providing special typewriters equipped with large, clear type such as is shown in the sample on this page. The universal use of the touch system in these classes, plus the large, clear type which appears as the finished product, causes eyestrain to be reduced to the minimum.

The L C Smith Typewriter, equipped with BULLETIN-CASLON type, is being welcomed and endorsed everywhere as an extremely valuable sight-saving aid.

The classes that use this new BULLETIN - CASLON type are **adapting the system to the child, rather than the child to the system.**

This is BULLETIN-CASLON No.27 Type

Illustrated above is an accurate reproduction of the actual type sizes found on the L C Smith Typewriter when equipped for sight-saving classes. What a boon this type is to the child of defective vision!

We shall be glad to send further information to any interested school executive or teacher. Let us know if you would like us to send more samples of BULLETIN-CASLON type.

PRIMER TYPE

For Use in Elementary Grades on either the L C Smith Standard or Corona Portable Typewriter.

Primer type, conforming to the size and style in primers, is a valuable aid in the preparation of silent reading seatwork tests in primary classes. At the right is shown one of these tests, minus margins and the representation of the snow man that appears at the bottom of the page. On the picture of the snow man each child is expected to exercise his artistic abilities in accordance with the printed instructions.

We shall be glad to send other specimens of silent reading seatwork tests, prepared on Corona Portable or L C Smith typewriters equipped with Primer Type, to any school superintendent, principal or primary grades supervisor who may be interested in investigating further this effective tool for making worth-while use of the child's time between oral classes.

SILENT READING SEATWORK TEST

THE SNOW MAN

See the big snow man.

Make his eyes black.

Make his mouth black.

Put some arms on the snow man.

His nose is blue.

Put a red cap on his head.

His name is Mr. White

Write his name under the snow man.

YAWMAN AND ERBE MFG. COMPANY

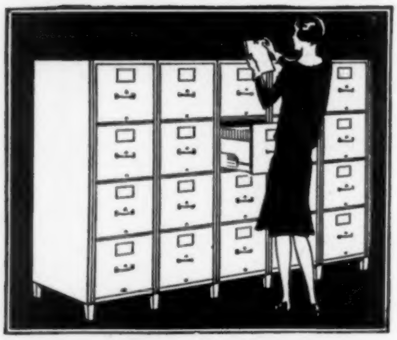
MAIN FACTORIES AND EXECUTIVE OFFICES

17 Jay Street, Rochester, N. Y.

Steel-and-Wood Files, Steel Shelving, Desks, Safes, Office Systems and Supplies

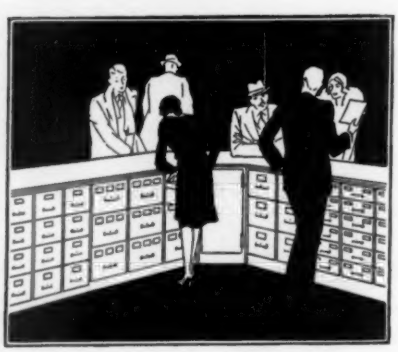
"Y and E"

Bank and Library Equipment, School Administration Equipment



STEEL FILES

STEEL DESKS



STEEL COUNTERS

"Y AND E" MAKES EVERYTHING FOR YOUR OFFICE

Possibly you have been thinking about some new office equipment. It may be a single item such as a desk, filing cabinet or chair, or you may be considering complete equipment for one office or an entire building.

Investigate. Get equipment that is built for your particular needs; get equipment that is modern in the work that it accomplishes as well as the appearance it presents; get equipment that will pay you the biggest dividends in saving of time and labor—and in speeding your office work.

Take a steel filing cabinet for instance. Any steel file will contain your records. But it is possible for you to get a cabinet that will not only contain your records but protect them from fire as well. So when buying steel files why not get files that have this extra advantage? "Y and E" Fire-Wall steel files have double steel walls insulated with asbestos. The drawers operate on ball-bearing slides and each drawer is

equipped with an automatic safety latch that keeps the drawer shut regardless of the position of the cabinet.

The protection of vital irreplaceable records is a personal responsibility of each individual business. Such records cannot be covered by insurance against loss or destruction, nor can their safe-keeping be delegated for outsiders. "Y and E" Underwriters' "A" and "B" Label Safes were designed and built to answer the demand for certified protection that is permanent.

And in a "Y and E" efficiency desk drawers operate on roller-bearing slides. All often-referred-to records right at your finger tips.

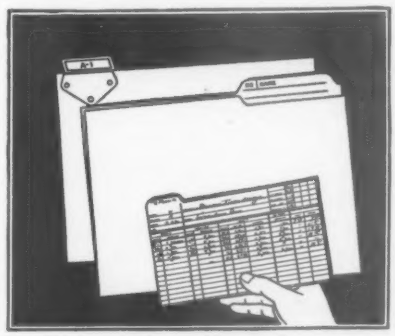
Then, too, there are the "Y and E" courses, text books and practice equipment for teaching indexing and filing. No secretarial or business course is complete that has not thoroughly covered this important subject. Fully described in the commercial section of this book.

Briefly we mention just a few of the items manufactured by "Y and E" and the illustrations on these pages are only suggestive of the complete lines of "Y and E" office equipment. Descriptive literature and detailed information covering any of the various items or groups will gladly be sent you on request.

YAWMAN AND ERBE MFG. CO.

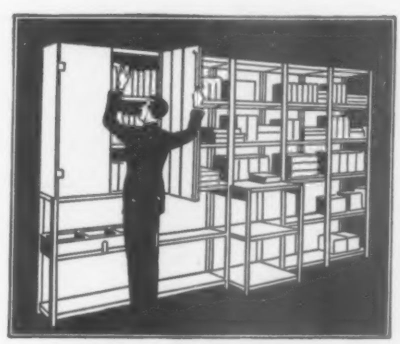
DESKS — SAFES — FILES
for
School, Bank and Library Equipment

"Foremost for Fifty Years"



FILING SYSTEMS AND SUPPLIES

STEEL CUPBOARDS



STEEL SHELVING

ALJO MANUFACTURING CO.

130 West 21st Street

New York, N. Y.

ALJO

REG. U.S. PAT. OFF.

The ALJO Line Includes:

- Batik Dyes
- Fresh Flower Colors
- Dried Flower Colors
- Artificial Flower Colors
- Flower Bleach and Fire Proofing
- Dry and Pulp Colors
- Scenic Artists' Supplies
- Aniline Dyes
- Bronze Powders
- Poster Colors
- Scenic Brushes

Of the above products, Art Departments in the higher grade schools and colleges are now making considerable use of our Batik Dyes and Poster Colors, and an ever-increasing number are using our Scenic Colors in the designing and painting of their own scenery for plays, pageants and other functions.

ALJO Batik Dyes

Batik Dyeing and Painting has now become one of the most popular subjects covered in the Art Departments of our high schools and colleges. The Board of Education of the City of New York, after thoroughly examining and testing ALJO Batik Dyes, have adopted them as the most successful and economical dyes for this work. A majority of the commercial Batik concerns are also using ALJO Batik Dyes exclusively, being convinced that these dyes are in every way most suitable for their purpose.

ALJO Batik Dyes are the practical result of ten years of daily experience in direct contact with artists, instructors and students of this line of art, in the course of which we were enabled to study the requirements that were most suitable and to make the selection of colors that would best conform to the nature of the work required.

Let us send you our circular containing a list of the colors, also the various sized packages and prices. A color card and any further information desired will be mailed on request.

ALJO Scenic Colors

Owing to the demand for Scenic Colors received from high schools, colleges and institutions, we have found it necessary to establish a special Scenic Color Department with a complete line of all supplies and colors used for this work.

The interest of school and college audiences is greatly increased by the knowledge that the students themselves have designed and painted their own scenery, and the work is greatly enjoyed by students having artistic ability. For this purpose colors of distinct character, brightness and quality are essential. ALJO Scenic Anilines have a brilliancy and effectiveness which highly commends their use for this work.

Lists of colors and supplies, with prices and other information, will be sent at the request of any school or college official or art department.

BAUSCH & LOMB OPTICAL CO.

674 St. Paul St., Rochester, N. Y.

New York Chicago Boston Los Angeles San Francisco
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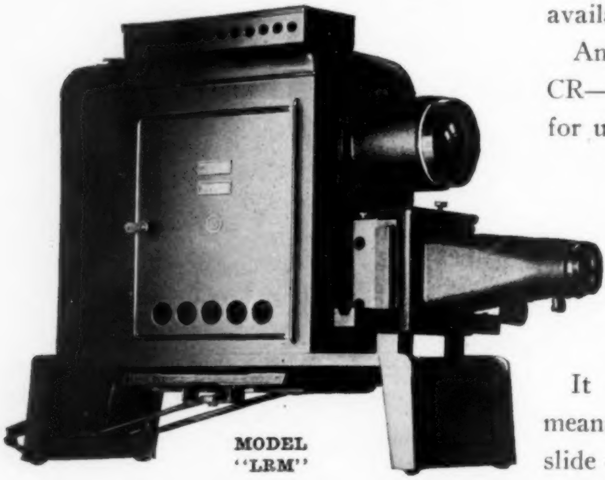
Bausch & Lomb Balopticons furnish the best means for utilizing the materials available for visual methods of education.



MODEL "LRM"

There are models for the use of strip film (film slides), for the projection of lantern slides and for opaque objects, models for use where darkened rooms are inexpedient—in fact, there is a Balopticon for every type of "still" projection.

Some of the more popular Balopticons for school use are described on this page.

Model "LRM"

This lantern was especially designed for the projection of either lantern slides or opaque objects in rooms where projection distance does not exceed twenty feet. Hence it is an excellent classroom instrument.

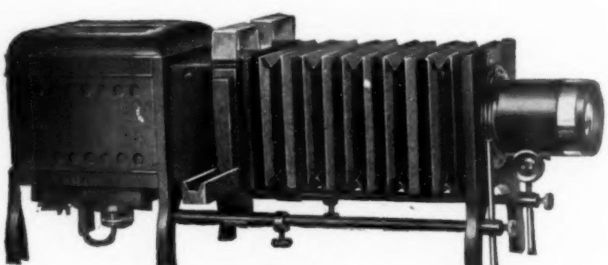
It can be arranged for the use of film slides or even for micro-projection, where desired, by means of attachments which are available.

Another combined Balopticon is Model CR—a truly fine projector. This model is for use in larger halls.

Model "B"

This Balopticon is one of the most popular instruments for use with lantern slides only. It is light, compact and highly efficient.

It can be carried about easily by means of a handle placed directly over the slide carrier at the center of balance. The extension cord can be detached from the Balopticon to facilitate handling.



MODEL "B"

Model B can be obtained for use with ordinary house current, storage battery or acetylene burner.

Bausch & Lomb Optical Company also manufacture Microscopes and accessories, Microtomes, Colorimeters, Refractometers, Spectrometers, Micro-projection Equipment, Photomicrographic Apparatus, Photographic Lenses, Binoculars, etc. Also manufacturers of Orthogon Eyeglass Lenses for Better Vision.

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"OUR LEADER" SPOTLIGHTS

For 250- or 400-Watt, G-30 Lamps.

Prices include 250-Watt, G-30 Stereopticon Lamp, Metal Color Frame, 6 sheets of assorted Colored Gelatine, 10-foot Asbestos Wire and Attachment Plug, complete, ready to attach.

Construction of spotlight hood made entirely of heavy-gauge sheet metal, all joints electrically spot-welded, finish dull black, hinged door at rear to give immediate access to lamp and interior. Metal grooves on face of spotlight hood to engage metal color frames with colored gelatine. Bow bracket attached with thumb screws for mounting in various positions. Fittings arranged for universal swing permitting hood to be swung or tilted at any angle. Sliding carriage with receptacle mounted thereon with lamp, having a 2" focus range to focus for a small spot or flood-lighting.

CAT. 51—Spotlight mounted on telescoping pipe standard, having a range from 3 to 6 feet in height—complete, with lamp. **$10.50**

CAT. 51A—Spotlight mounted on telescoping pipe standard, having a range from 3 to 6 feet in height, 5 opening, spoked color wheel with colored gelatine, complete, with lamp **$15.00**

CAT. 50—Spotlight mounted on base—hood detachable, can also be used as footlight spot or for ceiling or side-wall mounting as CAT. 47-48—complete, with lamp. **$8.50**

CAT. 47—Spotlight with bow bracket as foot support reversed bracket for ceiling and side-wall mounting as CAT. 48—complete, with lamp **$7.50**

CAT. 48—Spotlight with bow bracket for ceiling or side-wall mounting, reversed bracket for footlight spot, as CAT. 47—complete, with lamp **$7.50**

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Ideal, handy, compact, lightweight, well-ventilated units adaptable for the small stage

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STURDINESS is one of the first thoughts in portable seating because chairs must fold for transfer from use to storage and must stand a degree of careless handling. Therefore, all connected parts of the chairs must be substantially held together. The backs of portable sectional chairs are an essential part in holding each sitting together and rather than use single parts by glueing one chair to the other this feature is met in the "Brunswick" by continuous back rails rivetted and screwed to each leg. The seat has no glued parts, the slats being housed by doubly pressed steel arms, giving precision and wonderful strength without possibility of change from their intended position.

THE STEEL-WOOD No. 241 Folding Chair weighs 7½ lbs., is 1½ inches thick when folded, is put together with rivets and screws and is thoroughly steel-bound. Stamped steel arms at the seat, steel cross-braces at back and front. A steam-bent back gives the advantage of being curved both horizontally and vertically—a wonderful formation for comfort. The seat is curved. This combination of steel and wood is found to be more practical than either all steel or all wood.

THE STEEL-WOOD NO. 241

PORTABILITY—embraces simple folding, easy handling and compact storing: 1st—The seat when it is turned up does not hit the back by about an inch space. 2nd—When the entire chair is being folded the seat moves to the back and the legs nest closely. 3rd—After being folded the chair stands substantially upright on the floor without any support. 4th—When the section of chairs is set aside the lower part of the standards come closely together, leaving each seat and each back standing apart from any rubbing, as shown below.

SOLID COMFORT is obtained in the "Brunswick" by a deeply curved back set low to support the occupant below the shoulder blades—giving greater comfort for long periods and deep breathing than higher backs. Consistent pitches of the back and seat are used to meet the average stature. The seat is shaped so as to be restful and allow freedom of movement.

OAK—the wood of woods has been adopted, thus keeping the "Brunswick" in the class it rightly belongs. It has the reputation of being the best portable chair known.

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Patented Chalk Rails and Metal Blackboard Trim

116 West Kansas St., Liberty, Mo.

PRODUCTS

Dustless All-metal Crayon Trough with Eraser Cleaner; **Metal Blackboard Trim; Sanitary Metal Base.**

Also Chair Rail Wainscot Trim and Fittings.

DUDFIELD'S DUSTLESS ALL-METAL CRAYON TROUGH, DUST TRAYS AND ERASER CLEANER

DUDFIELD Dustless All-metal Chalk Rail and Metal Blackboard Trim

The main trough is made of one piece of No. 24 gauge special tight coated galvanized "Cop-R-Loy" iron in 8 and 10-ft. lengths. Cast metal ends and mitered corners are used, adding to its stability and making installation easy. Sections are butted together when installed, the ends being held in position by a concealed metal bracket at the joints.

Dust trays are made of No. 28 gauge "Cop-R-Loy" galvanized iron in 47-in. lengths for ease in cleaning. Eraser cleaner is made of No. 20 gauge galvanized iron. The slotted construction gives a scraping effect the full width of the cleaner and being smooth does not cut the erasers.

All units except the dust trays and eraser cleaner are given a priming coat of good quality gray paint at the factory.

Distinctive features are as follows:

Sanitary — Eliminates chalk dust from the room.

Time Saver — A slight rub on the screen keeps the eraser clean.

Fireproof — Made entirely of metal.

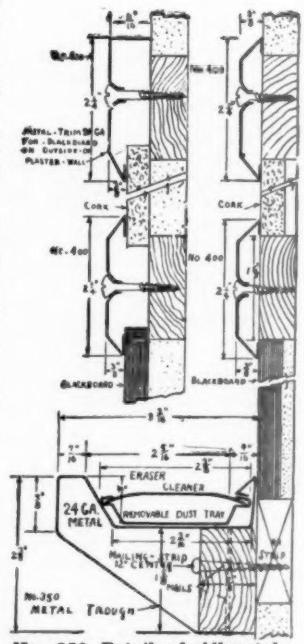
Artistic—Simplicity of construction enriches appearance.

Durable — Heavy gauge metal withstands hard usage.

Practical — Does not warp out of shape or away from the blackboard.

DUDFIELD'S METAL BLACKBOARD TRIM

Made of No. 20 gauge special tight coated galvanized "Cop-R-Loy" iron in 8 and 10-ft. lengths. No. 400 pattern is for use on blackboards set flush with walls; and pattern No. 400-A for blackboards set on outside of walls. The No. 400 pattern is usually preferred for the reason there is no ledge to catch dust. Corner caps and "T" fittings furnished. The No. 400 pattern can be used as a wainscot cap, also chair rail interior and exterior angles furnished. Primed at factory with a coat of good quality gray paint.

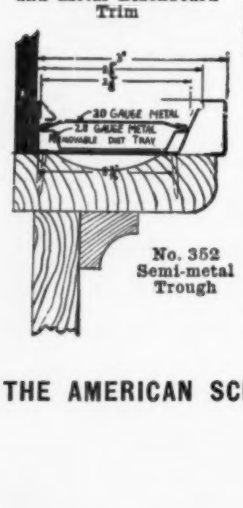


No. 350 Detail of All-metal Trough, No. 400 Metal Trim

OFFICIAL ENDORSEMENT AND SAMPLES

These products have been endorsed by State school superintendents, boards of health, architects, universities, colleges, sanitary and ventilating engineers.

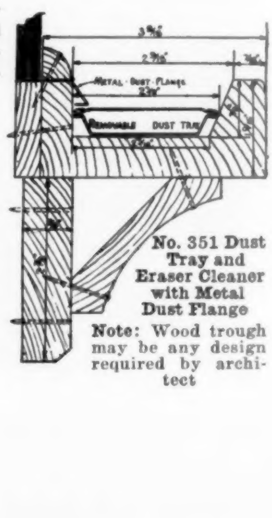
Specifications for installation furnished on request. Write for samples, full size detail drawings and literature.



No. 352 Semi-metal Trough

SECTIONAL VIEWS OF DUSTLESS CRAYON TROUGH

Only metal parts are furnished by the manufacturer. Metal trough, metal trays and blackboard trim cut to exact lengths when ordered; give outside measurements of blackboards over all. When ordering, state whether blackboards are set flush with or on outside of plastered walls.



No. 351 Dust Tray and Eraser Cleaner with Metal Dust Flange

Note: Wood trough may be any design required by architect

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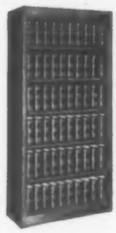
36x18x78"
36x21x66" or 78"
36x24x78"

Stationery Cabinet
W. D. H.
36x12x66" or 78"
36x15x78"
36x18x66" or 78"

Teachers' Cabinet
W. D. H.
36x18x78"
36x21x78"
36x24x78"



"Doorless" Cabinet
W. D. H.
36x 9x66" or 78"
36x12x66" or 78"
36x18x66" or 78"

Sportsman's Cabinet
W. D. H.
36x18x78"
36x21x78"
36x24x78"

Janitors' Cabinet
W. D. H.
36x18x78"
36x21x78"
36x24x78"

In schools, colleges and clubs where games and other athletic activities are carried on, the problem of providing adequate storage facilities sometimes seems quite perplexing to those who are not acquainted with the advantages of Durabilt Steel Cabinets.

These cabinets provide secure, convenient and economical storage for such equipment as dumb-bells, Indian clubs, balls, bats, bases, players' suits, guards, and numerous other items of value.

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Durabilt Cabinets are unusually inexpensive while the quality features of design, materials, and finish will surprise the most exacting buyer.

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36x18x66" or 78"
36x24x78"

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The flanged shelves prevent balls, etc., from rolling off.

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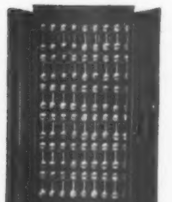

Dumb-bell Cabinet
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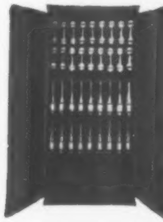
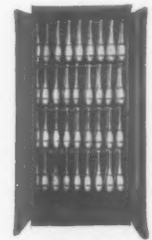
Equipment consists of special holders, each having a capacity of nine pairs of Dumb-bells or Indian Clubs.



Combination Club and Bell Cabinet
W. D. H.
36x12x66" or 78"
As many holders can be placed in cabinet as the height permits.

Key Cabinet
(Capacity 100 to 800 Hooks for Locker Keys. Larger Keys reduce capacity.)

	W. D. H.
Small	15x4½x30"
Large	24x4½x30"



Indian Club Cabinet
W. D. H.
36x12x66" or 78"
Start with one or more holders as required—add more as needed. Same holders also used for Dumb-bells.

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Thos. A. Edison's New Dictating Machine

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The Secretarial Ediphone enables secretaries to organize their work, to give more thought and care to each duty and to perform many duties always wanted but impossible for lack of time.

The new Ediphones are distinguished by electric control, succeeding slower mechanical devices.

The dictator enjoys speaking conversationally and comfortably to a large mouthpiece which clearly records the voice.

Stenographers have the voice at the finger tips with Typease, attached to any typewriter. A light tap by the thumb, like operating the space-bar, causes the voice to speak or repeat. This is ideal for the touch typist, adding speed and reducing fatigue to a minimum.

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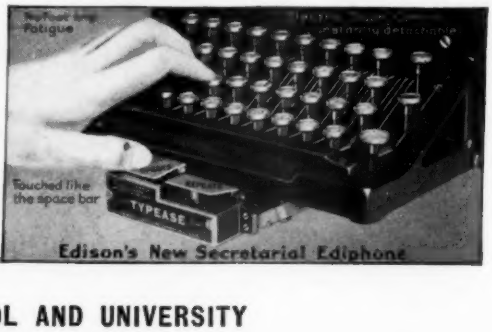
Ediphone Sales and Service stations in all principal cities study correspondence problems and advise with executives without charge.



Edison's New Secretarial Ediphone

Telephone the Ediphone, your city, for particulars or ask us for the booklet "Getting Action." It's free.

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Electro-Acoustical Equipment and Engineering

Sound Amplification Necessary

Electro-Acoustic Amplification Systems are rapidly becoming an essential part of the modern school plan.

With this equipment, the entire school with its many rooms may be addressed simultaneously from any point where a microphone location is made, as for instance, the principal's office or the rostrum of the auditorium. Electro-Acoustic Systems are selective—any one, all, or any specific group of rooms can be addressed.

Radio programs of an educational or recreational value, lectures, callisthenics instruction, and music, may be broadcast throughout the **entire school** or to **any predetermined room** or **rooms.**

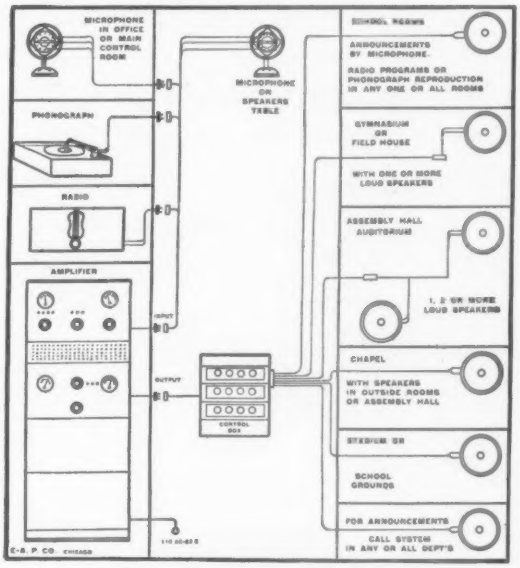
Electro-Acoustic Systems are indispensable in the stadium or auditorium.

Fire or emergency alarms with directions and instructions may be broadcast most effectively.

These are only a few of the many uses of an Electro-Acoustic System in schools.

They offer many conveniences, **save time,** and **afford immediate contact** with every room.

How Electro-Acoustic Systems Operate in Schools



A speaking or singing voice, a radio program, orchestra or phonograph recording, is amplified and reproduced through the loudspeakers with every natural detail. The loudspeakers are inconspicuously mounted in the walls and may be located any distance from the transmitter. Any number of speakers may be operated simultaneously or selectively.

Electro-Acoustic Systems reproduce voice and music with precise reality.

Being entirely operated from the house lighting system, the apparatus does not require batteries. No maintenance or extra attentions are necessary.

Electro-Acoustic Systems are preferred by the leading institutions of the country because of their extreme efficiency, simplicity of operation and freedom from maintenance service.

The Electro-Acoustic Products Company offers school executives and architects the benefits of its wide experience in engineering, installing and supervising electro-acoustic installations. Write for complete information.

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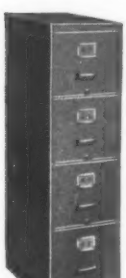
A full line of steel desks in all sizes and finishes. No warping drawers or splintered edges to ruin stockings. Pleasing Velvoleum tops are easy to write on and easy on the eyes. Never wear rough.



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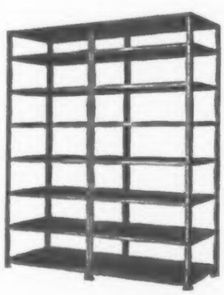
Quiet, easy-running drawers of large capacity. Long life, strong and rigid. Drawers never stick shut. Unusual protection to contents. Furnished with lock, if desired.



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Space-saving and enduring. Reduces fire hazard and promotes orderliness in the store room. Optionally reinforced where necessary for varying loads. Can be built fully enclosed with doors and locks.

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For fire protection of important files such as student records, accounts and other valuable records. Tested and labeled by Underwriters' for fire and burglar protection. Large, medium and small sizes.

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A special type of shelving for libraries. Adjustable shelves clean and easily kept free of dust. Illustration shows installation for University of Minnesota.

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Clean, orderly localized storage for class rooms, laboratories and work rooms. Finished in pleasing olive green, mahogany or walnut. Locks give full control to custodian.

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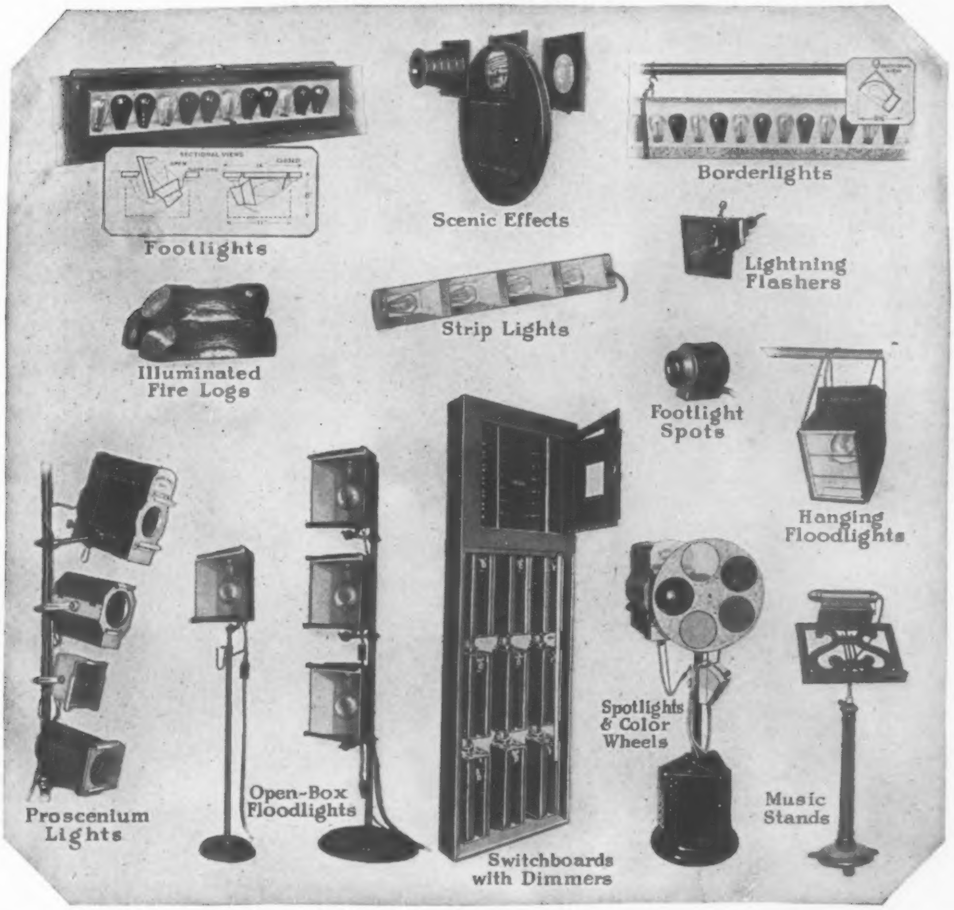

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We manufacture a complete line of lighting specialties for the stage, campus and stadium—proper and suitable lighting equipment and apparatus for school theatricals, night illumination of athletic events and other school activities—such as:

Spotlights	Connectors	Footlights
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Descriptive and illustrated literature giving important details and other useful information regarding our products and their applications will be furnished upon request.

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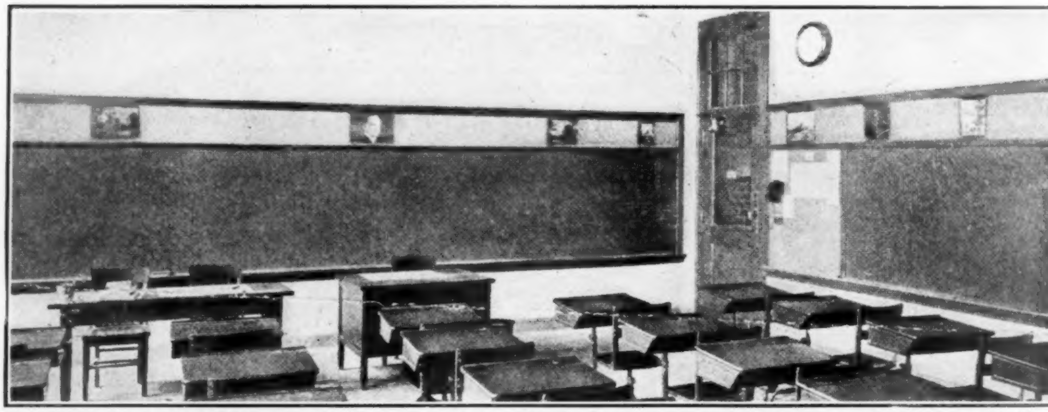
School authorities and architects are invited to submit their plans and specifications to our engineers for checking and recommendations—to insure satisfactory lighting arrangements and installations in accord with the best present day practice.

Guarantee

The accumulated knowledge and experience of more than thirty-four years devoted to the design and manufacture of specialties for theatrical, decorative and spectacular lighting is embodied in Kliegl products, and they are fully guaranteed in every respect.

PADDOCK CORK COMPANY, INC.

1209 DeKalb Avenue
Brooklyn, N. Y.



CLASSROOM SHOWING EUREKA CORK USED ABOVE AND AT THE SIDE OF STANDARD BLACKBOARD
(Wm. S. Hackett Junior High School, Albany, N. Y.)

EUREKA CORK BULLETIN BOARDS

Eureka Cork Bulletin Boards are used in the classrooms of 3000 schools because they—

Provide a suitable place to display papers and exhibits;

Make tacking up of display material easier;

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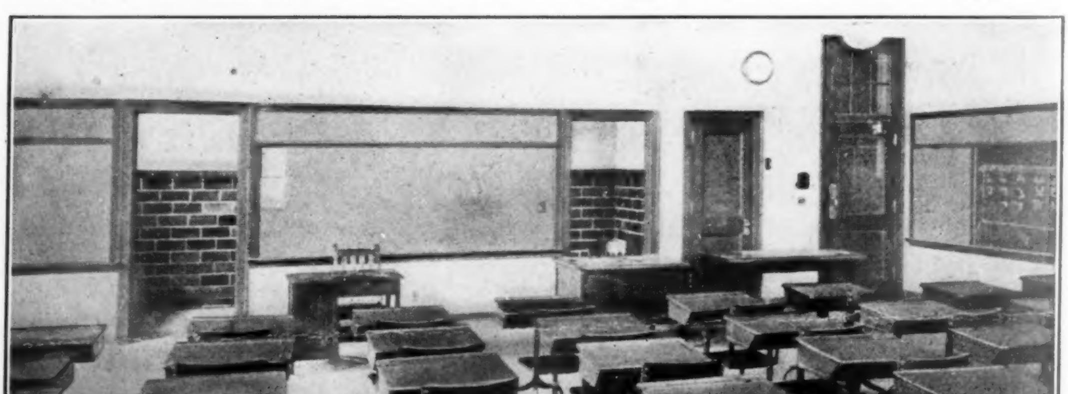
And are inexpensive to maintain.

They are made from the finest pliable sheet cork ¼-inch thick, the face sanded to a clean, smooth, even surface. The cork is reinforced with burlap backing and cemented to three-ply compo-board with wood core.

Eureka Cork Bulletin Boards are supplied in lengths up to 14 feet and widths up to 4 feet, or they are cut accurately to the exact sizes required, so that fitting and trimming on the job are unnecessary. They are furnished in two colors—green and tan.

Eureka Cork Bulletin Boards will not warp or shrink. They are practically everlasting. Over 3000 installations, and not a single replacement.

Samples will be furnished on request.



CLASSROOM SHOWING EUREKA BOARD USED IN PLACE OF BLACKBOARD
(Drawing Room, Wm. S. Hackett Junior High School, Albany, N. Y.)

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Manufacturers' Exchange Building

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PROSE-MACO Removable-Non-Removable Coat Hangers.

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Partially Multiple—SEMI-MULTO

BOOK BOARD—Either 2, 4, or 6 Leaves, Each 48-inches wide by 36-inches high.

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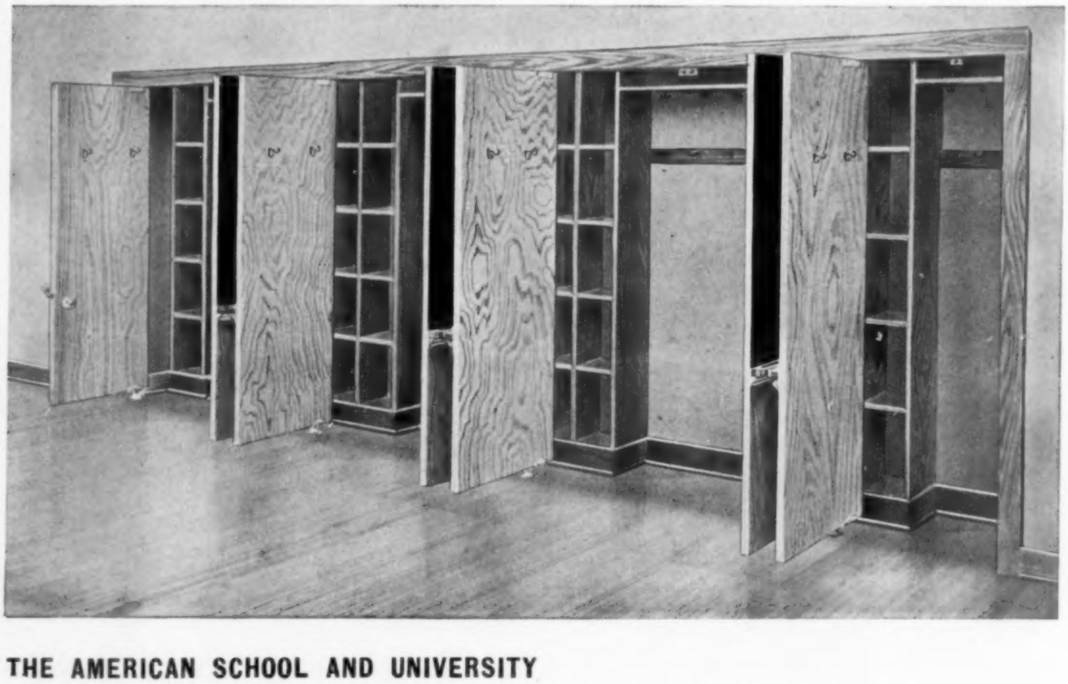

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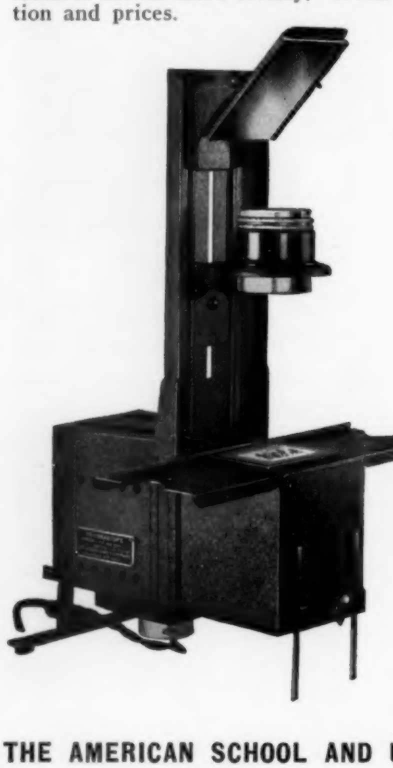
Spencer Lecture Table Delineascope—Model B

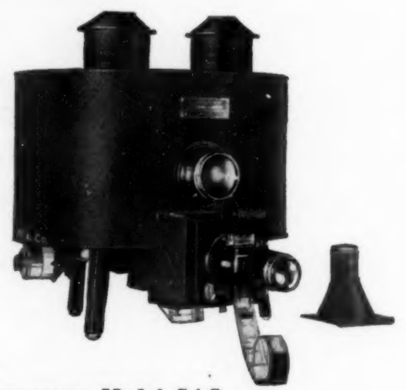
This is the only lantern in the world permitting the lecturer to face his class and the lantern.

Note, in the picture below, that the slide lies horizontally on top of the Delineascope. The professor, lecturing before his class, points with a pencil to the particular feature on the slide which he desires to emphasize. The slide and pointer images are projected on the screen behind him, just above his head. The whole class sees them, gets the professor's point. He then snaps off the light, goes on with his lecture. No time lost, before or afterwards, with shade-pulling to darken the room; plenty of light for taking notes. Later on, in the course of his lecture, he has occasion to show another slide. He uses it with the same ease as before, without changing his position in front of his class.

When the slide is in proper position on the lantern, objects (including reading matter on the slide) come right-side-up to the operator and lecturer, so that he has no difficulty in pointing with his pencil to any particular point of emphasis.

Model B Delineascope would help put your lectures across more vividly. Write for description and prices.





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Model SAC (above) is a four-purpose lantern—for projecting opaque objects, filmslides and micro-slides as well as the regulation lantern slides. This is our regular Model S, an opaque projector, with the addition of a glass slide device and a filmslide attachment having slideways accommodating standard size micro-slides. It is so constructed that it may be set up a few feet behind a translucent screen and produce an excellent clear-cut picture in a semi-lighted room.

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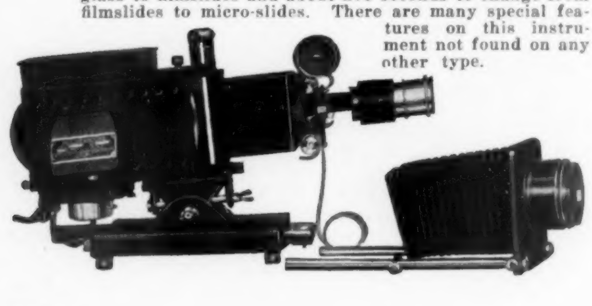

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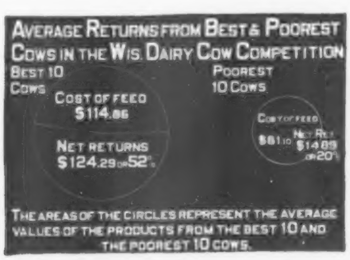

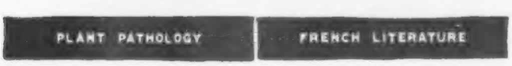

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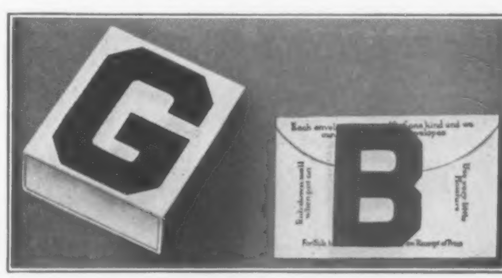

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Note: The Welsh track is specified by the Board of Education, City of New York, for installation in the City's Public and High Schools for proscenium arch curtains.

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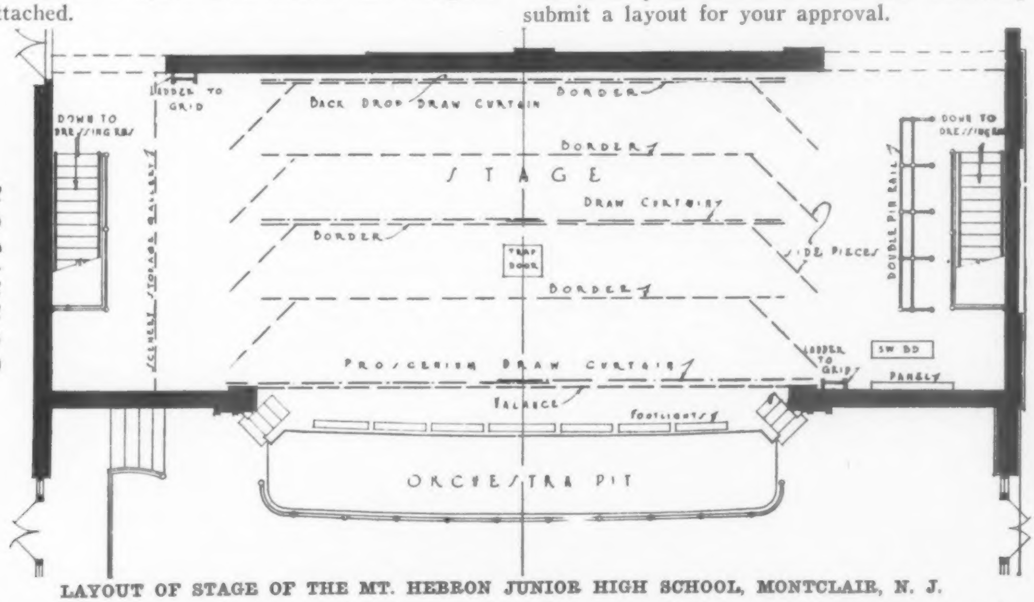

LAYOUT OF STAGE OF THE MT. HEBRON JUNIOR HIGH SCHOOL, MONTCLAIR, N. J.

Attention is called to the type of cyclorama shown above. The whole stage is masked with curtains hung as indicated in the drawings. It is possible to clear the whole stage and still have the sides masked, or clear any portion of the stage. A double pin rail is provided because it is advisable to have the necessary pulleys and chains not only to take care of the school scenery, but to take care of the additional battens and rails that are always required for the installation of special scenery and lights. With this arrangement it is possible to pull up the regular stage equipment and then quickly install the special equipment and floodlights required for the special production. The stage should also have a built-in cupboard for the installation of a radio which can be kept under lock.

Section VII

COMMERCIAL EDUCATION

Design and Equipment of Rooms for Commercial Education in High Schools

BY CLYDE B. EDGEWORTH

SUPERVISOR, COMMERCIAL EDUCATION PUBLIC SCHOOLS, BALTIMORE, MD.;
INSTRUCTOR, SUMMER SCHOOL AND THE COLLEGE FOR TEACHERS, THE JOHNS HOPKINS UNIVERSITY

THE two factors which enter into the decisions of school administrators regarding the size of classes in junior and senior high schools, are local experience and local economic conditions. Housing conditions and the amount of money to be expended on teachers' salaries have, in spite of the opinions of educational experts, the greatest bearing on the size of classes. Educational and school building experts are generally in agreement regarding space per pupil, lighting, heating and ventilating. Few school-building programs are carried out today without the approval of authorities on these subjects.

Baltimore, during the past several years, has been carrying on an extensive building program. This program will continue for some time to come. The 40-pupil unit has been determined on for academic and commercial classes in both the junior and the senior high schools. Commercial educators will probably consider this figure too high for the most efficient work, but as long as academic classes are placed at that figure, it will be necessary for those interested in commercial education to accept the 40-pupil unit. Otherwise, school administration becomes a difficult problem.

The Building Planning Procedure in Baltimore

The procedure followed in Baltimore has proved very satisfactory, at least for that city. A building is planned for a particular community, the total pupil capacity is determined, and architects' plans follow. After consultation with the various experts, but before final acceptance of the plans, those interested in special phases of education, such as commercial, are called in for suggestions and recommendations regarding their various departments. The probable commercial enrolment can very easily be determined by comparisons with schools of the same type in similar communities. By giving the curriculum careful consideration, the number of rooms needed for the special commercial subjects, bookkeeping and typewriting, are now known. The location of the commercial department is fixed and the housing of a given number of commercial students is planned for. The general plans for the building call for standard classrooms 25 feet 6 inches by 22 feet 6 inches (Fig. 1). Such a room will take care of 40 pupils.

Standard Units in Junior High School

Such a standard unit in a junior high school is used for junior business training, commercial arithmetic and penmanship. All standard classrooms have a built-in bookcase and a storage closet. All rooms used for commercial subjects are equipped with a steel file, three drawers, letter size, two drawers for cards. A standard room contains 40 regular pupil desks with a teacher's desk and chair (Fig. 2).

In order to provide rooms of the proper size for bookkeeping and typewriting, partitions are moved on the plans, making three standard units into two units for these special subjects. This provides a room 39 feet 6 inches by 22 feet 6 inches (Fig. 3).

Such space nicely houses 40 regulation, adjustable bookkeeping desks, and allows for plenty of aisle space (Fig. 4). These desks can be purchased on bid at an approximate cost of $12 each.

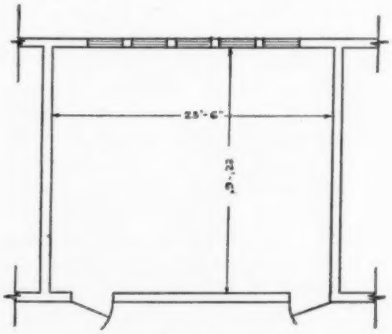

FIG. 1

FIG. 2

Typewriting rooms are the same size as bookkeeping rooms, and are equipped with 40 individual typewriter desks and 40 bentwood chairs (Fig. 5). The desks are of oak with a solid tongued and grooved top. They are single pedestals of regulation height, with three drawers, strongly built, angle-ironed, and nicely finished. These desks are purchased on bid; the specifications have been worked out by the division of commercial education. The desks can be bought in quantities at a cost of between $8 and $9. A typewriter desk with a three-position adjustable top is preferable, but the cost for Baltimore is prohibitive. In order to provide for students of different heights, the chairs may be made as many heights as desired. Adjustable chairs may be desired by some commercial educators, but again the question of high cost arises, coupled with the fact that adjustable chairs are rarely ever adjusted, even when provided. The 40 typewriters should be standard makes and should be equally divided between the machines used in the community. This provides an equal training opportunity for all pupils.

FIG. 4

In the Senior High School

The standard classroom in the senior high school may be used for classes in commercial arithmetic, shorthand, commercial law, salesmanship, penmanship, business organization and management, and economics. So far, it has been impossible to secure the type of room desired for commercial geography. It is recommended, however, that a room a standard unit and a half in size be provided for this subject, that it be equipped with 40 regular pupil desks, that additional bookcases be provided, and that display cases for commercial products be placed in this room. A projector or lantern and screen should be a part of the equipment. It is also desirable

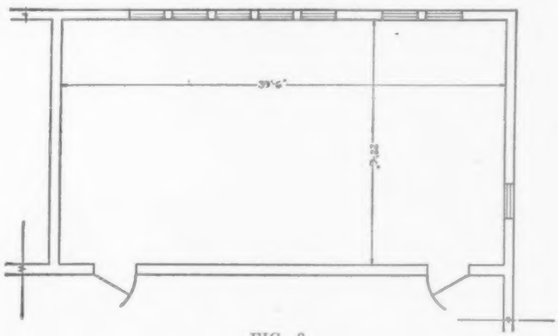

FIG. 3

to have several work tables and a number of chairs. The latest commercial geography map equipment should also be provided.

The bookkeeping, accounting and typewriting classes are held in the same type of rooms as provided for these subjects in the junior high schools, with the same type of equipment. (See Figures 3, 4 and 5.) The commercial department classrooms are grouped around a central stockroom and a department head's office. All rooms in both junior and senior high schools are provided with ample blackboards, bulletin boards and electric outlets.

In the senior high school, a most important subject is to be provided for, namely, office practice and machines. Since the office of today is mechanized, it is necessary that all commercial students know how to operate the types of

FIG. 5

equipment they are going to meet in the business office, and that many more be trained for the office trades. It is important that the most efficient layout and equipment possible be provided. Much help can be secured from Professor F. G. Nichols' "A New Conception of Office Practice," published by The Harvard Press. Considerable research has been done in Baltimore to determine the best type of layout. The result of this study is shown in Fig. 6 at the bottom of this page.

Provision for Office Practice Work

A stockroom for the office practice work is very necessary; one 7 feet 6 inches by 12 feet, with plenty of shelving, is provided for on these plans. Such a room takes care of the large amount of supplies required and provides a storage space for the students' filing sets and the small equipment when not in use. A room 15 feet 2½ inches by 12 feet is set aside for dictating and transcribing machines, and typewriters. This room will provide space for four or five units. This arrangement provides a reasonable amount of quiet, especially if noiseless typewriters are used, and takes this unit of work away from the distractions of the larger room.

The main office practice room is 40 feet 2 inches by 23 feet 2½ inches, and it should have an abundance of electric outlets around the walls. The necessary equipment will, to a large extent, be determined by the equipment used in the community and by the employment opportunities. It is best to arrange the equipment by units. No attempt has been made to place the units on the plan. The office practice teacher should be given some latitude in this arrangement. The two important things are the housing facilities and the equipment. The equipment should consist of a bookkeeping machine of each make used in the locality, billing and manifolding machines, addressing machines, a complete multigraph equipment, mimeograph, ditto, calculating and adding machines of each type, key-driven, crank-driven, and ten key machines. There should also be provided students' individual filing sets for the 80-hour course, check protectograph and much miscellaneous equipment. Four or more filing cabinets are required for job sheets and students' work. The necessary equipment, furniture and supplies for the office practice will cost approximately $16,000.

The furniture and equipment for the commercial department is provided under the allotment for new building equipment. This should be sufficiently large to take care of at least the things set forth in this article. A well-planned and well-equipped department will do much to assure a progressive commercial educational program.

PRINCIPAL TYPES OF EQUIPMENT AND MACHINES INSTALLED

Adding Machines—Dalton, Remington, Sunstrand
Addressing Machines—Elliott, Addressograph
Billing Machines—Elliott-Fisher
Bookkeeping Machines—Remington, Dalton, Burroughs, Underwood
Calculating Machines—Marchant, Monroe, Burroughs
Check Protecting Machines—Todd
Comptometers—Felt & Tarrant
Dictating and Transcribing Machines—Dictaphone, Ediphone
Duplicating Machines—Ditto, Inc.
Filing Equipment—Remington, Yawman & Erbe
Filing System—Cardex
Mimeograph Machines—A. B. Dick
Multigraph Machines—American Multigraph Sales
Projection Equipment—Delineascope
Stapling Machines—Bostitch
Typewriters—Remington, L. C. Smith, Underwood, Royal

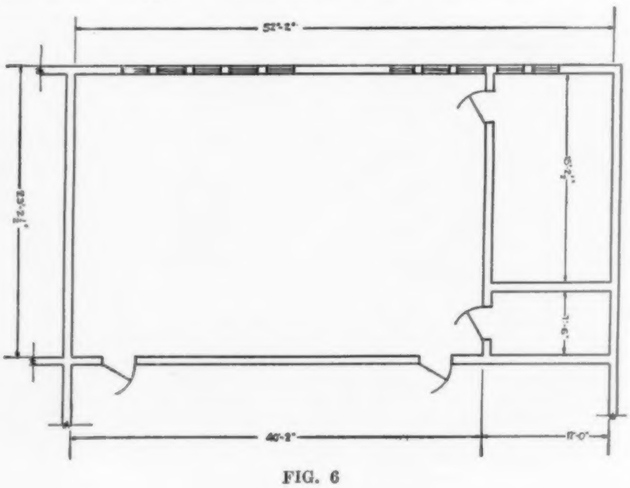

FIG. 6

Equipment for Bookkeeping and Accounting Classrooms*

BY PAUL S. LOMAX AND PETER L. AGNEW

NEW YORK UNIVERSITY, NEW YORK CITY

THE problem of properly equipping a commercial department is coming to be recognized as one that is quite comparable to the problem of equipping any other specialized department, such as the science department, the industrial arts department, and the home economics department.

In this article our discussion will be limited to the proper equipment of bookkeeping and accounting rooms of secondary schools, although much of the article will likewise apply to colleges and universities. Equipment is of vital importance in teaching bookkeeping. To be sure, the bookkeeping teacher must have teaching aims, he must know what subject matter he should teach, and he must know how to teach it. However, his teaching will tend to result in most effective learning only when the equipment of the classroom is most nearly ideal. The following suggestions pertain to what might be considered the ideal equipment for bookkeeping classrooms.

Bookkeeping Classroom.—In order to accommodate the larger desks necessary for teaching bookkeeping, the bookkeeping classroom should be somewhat larger than the classroom used for the teaching of the regular academic subjects. The number of students that should be cared for in a bookkeeping classroom should tend to be the number accepted by a given school system as its standard for all laboratory classes.

Desks.—As mentioned above, the desks used in the bookkeeping room should be larger than those ordinarily used for purely academic work. They should measure about 24 by 30 inches, with a flat top; they should be fixed to the floor, and may be either adjustable or of various heights. Inkwells may be provided for one or two kinds of ink, depending upon whether one or two kinds of ink are to be used in doing the book-

* Adapted in part from the authors' book, "Problems of Teaching Bookkeeping," Chapter X. Prentice-Hall, Inc., New York, 1930.

Courtesy of Yawman and Erbe Mfg. Co.

EQUIPMENT FOR MACHINE ACCOUNTING

Courtesy of Thomas A. Edison, Inc.

EQUIPMENT IN THE SPEEDWA SCHOOL FOR BUSINESS TRAINING, ST. LOUIS, MO.

keeping work. There seems to be less red ink used in business offices than was formerly the case. Some teachers prefer that the bookkeeping desks be provided with drawers in which the student may keep books, papers, rulers, pens, and other things that are not taken home. In some schools this system has worked out satisfactorily, but in many other schools these individual drawers have presented problems; students forget to bring their keys or, in leaving, forget to lock their drawers, with the result that delays are caused and losses of articles are suffered. A better scheme seems to be the cabinet system described below.

Chairs.—The chairs should be comfortable, should be adjustable or of various heights, and, where conditions permit, should be movable. Any difficulties arising from noise of movable chairs may be overcome by having the legs equipped with some sort of noiseless tips.

Cabinets.—A most effective way of providing for students' paraphernalia is to equip the bookkeeping room with cabinets in which each student has a tray similar to the ordinary desk tray used in business offices. These cabinets may be arranged in sections so that a separate section or two may be used by each class. A student may be made responsible for unlocking and locking the section that is used by his class, and seeing that each student gets his tray at the beginning of the period and that he returns it to its proper place at the close of the period. In these trays would be kept books, sets, papers, blotters, rulers, pens, and pencils that the student is not making use of in doing homework.

Teacher's Furniture.—The teacher's furniture should consist of a modern flat-top desk with drawers on each side, and a chair, preferably of the swivel type; also two extra chairs for visitors' use or for conference purposes; a long table for reference books and demonstration purposes; a filing cabinet in which the teacher may file corrected tests, papers, lesson plans, mimeographed exercises, and other materials that should be accessible; and a cabinet or supply closet in which books that are not in use, extra sets, paper, pencils, pens, rulers, and other supplies may be kept.

Blackboards.—The room should be equipped, not only with a fair amount of plain blackboard space, but also with some blackboard space that is permanently ruled in regular ledger and journal forms, so that the teacher will not find it necessary constantly to redraw these much-used forms. A sliding sectional blackboard similar to those used in science laboratories is ideal for this purpose. This type of equipment is usually made up of three or four blackboard sections which slide up and down in front of or behind one another, operating much as does the ordinary window sash. The different sections may be temporarily or permanently ruled up in various forms

used by the class, thus saving the teacher's time when he wants to illustrate various types of book and form work.

Supplies.—Each student should be supplied with a textbook, a brass-edged ruler, a penholder, a pen with a reasonably fine point, a pencil, and a blotter. Some plain paper may be used, but in the interests of time economy, most work should be done on regularly ruled ledger and journal paper. Sets should be furnished when the work of the class has progressed to the point where the students are ready to work out the sets.

The room should also be furnished with a pencil sharpener, a yardstick, a pointer, chalk, blackboard erasers, and a bulletin board. With the increased use of the fountain pen, it may be advisable also to furnish the room with a fountain pen inkwell.

Mechanical Devices

To a greater and greater extent we find machines being used in business offices. During recent years, there has been a growing feeling among educators that those students who are taking commercial work in schools should, during their school experiences, become acquainted with the operation of some of the more widely used devices.

Recent studies seem to indicate that, in connection with the study of bookkeeping, students should have an opportunity to become familiar with the operation of some of the various adding and calculating machines and of the various billing and bookkeeping machines now in general use.

Adding and Calculating Machines.—There seems to be no place for machines in an elementary bookkeeping course; the calculations necessary in this work are, or should be, relatively simple, and the working-out of them without the aid of machines is probably good practice for the students. In connection with advanced bookkeeping, however, some of the adding and calculating machines might be introduced. By being permitted to use these devices, the students become familiar with the operation of the machines, save considerable time, and find the bookkeeping work has more of the feel of business.

It seems advisable, then, to equip rooms that are to be used for advanced bookkeeping with a listing machine and a non-key-driven, non-listing calculator. The portable listing machines are excellent for school use, as they are inexpensive, have all the features of the heavier machines, and may easily be carried to the students' desks. If a third machine seems advisable, one of the ten-key adding-calculating machines, may be used.

Billing and bookkeeping machines should also be used in schools for instructional purposes. While unquestionably a great deal of bookkeeping is still done in business offices by pen and ink, we cannot overlook the fact that many offices are using billing and bookkeeping machines. With the increased use of these machines in business, it is doubtful if a school course in bookkeeping should be considered complete until the student has had some training on the bookkeeping machine. In some offices practically all bookkeeping is done by machine. In many others some parts of the work, such as billing, sales record work, voucher and voucher register work, and statement work, are done on machines. It seems increasingly imperative that schools recognize this condition and that they, at least in the senior year, give the students an opportunity to learn to operate at least one of these machines.

A Special Room for Mechanical Office Equipment

This twelfth-year course that might well follow advanced bookkeeping, which probably should be given in the eleventh year, may be planned so as to give students training in the use of the leading makes of adding and calculating machines as well as of the leading makes of billing and bookkeeping machines. A special room should be fitted up for this work.

This room should be sufficiently large to take care of the office equipment to be used therein. It should be planned more as a business office than as a regular classroom.

Of course the ordinary requirements about proper light, heat, ventilation, and cleanliness should be observed.

The remainder of the equipment of this room should be about as follows:

Key-driven calculators.—One of each make of key-driven calculators should be furnished if the course is designed merely to give the students a fair knowledge of the operation of these machines. If operators are to be well trained, a battery of these machines may be provided. Small tables similar to typewriting tables, or especially constructed desks, must be furnished.

Adding-calculator, non-key-driven, non-listing.

Ten-key adding calculator.

Listing machine, regular keyboard with direct subtraction.

Posting-statement machine.

Billing-bookkeeping machine.

Tables and desks.—Billing and bookkeeping machines come equipped with stands, as also do some of the adding and calculating machines. Tables or desks should be furnished for those machines not so equipped.

Chairs.—Movable chairs should be furnished. Regular wooden office chairs may be used or especially constructed "posture" chairs may be furnished.

Files.—Files for working papers and invoices should be furnished. Also, movable files, on trucks for use with the bookkeeping machines, should be part of the equipment.

Teacher's equipment.—The teacher's equipment should be much the same as that suggested for the bookkeeping classroom.

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Section VIII

HOME ECONOMICS—CAFETERIA—DORMITORY

Plans and Equipment for Home Economics Departments

BY EMELINE S. WHITCOMB

SPECIALIST IN HOME ECONOMICS, U. S. OFFICE OF EDUCATION

THE equipment of home economics departments in elementary, junior and senior high schools, like everything else in the American school system, is constantly undergoing changes with the view of improving it to meet better the personal, home, and family needs of boys and girls.

Location of Departments

Because of the importance of home economics in the school curriculum, the department is entitled to very good quarters. Just on what floor it should be depends upon the organization of the school, but at any rate it should not be placed where it is inconvenient of access or gives too many stairs for the children to climb. Except in very large buildings, it is not wise to distribute the laboratories of the department over the building. As far as possible, it should be planned en suite.

The basement for home economics is in disrepute. Rooms with the floor level below grade on the whole are not cheerful and are rarely as convenient as rooms on floors above grade. Basements are difficult of ventilation, and of heating except at increased cost for installation and upkeep. The views, if any are possible from basement windows, are generally unattractive, and the interest in looking at objects from the level or slightly above the level is lost. Even the sky loses its attractiveness and charm from a hole in the ground.

Lighting of Laboratories

The clothing and foods laboratories require as much light as the ordinary classroom. Clothing rooms should have a northern exposure, for this

THE KITCHEN IN THE HOME ECONOMICS DEPARTMENT OF THE FOREST PARK JUNIOR AND SENIOR HIGH SCHOOL, BALTIMORE, MD.
The same type of equipment is used in elementary schools

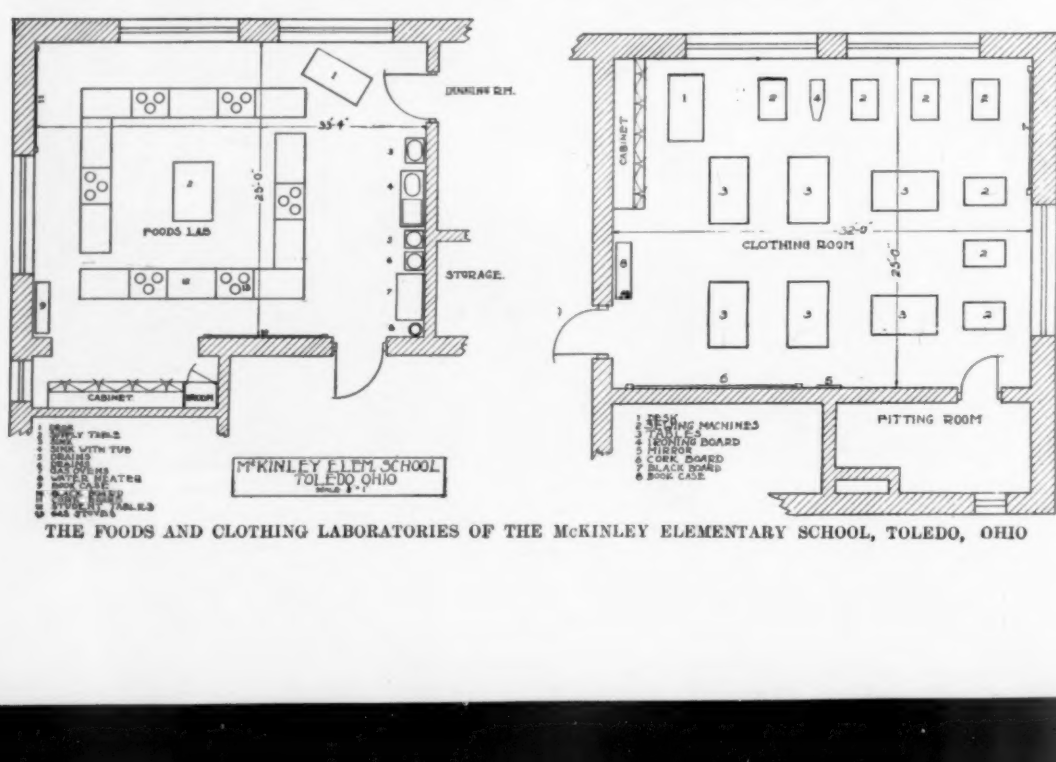
THE SEWING ROOM IN THE HOME ECONOMICS DEPARTMENT OF THE CLIFTON PARK JUNIOR HIGH SCHOOL, BALTIMORE

Standard equipment is used

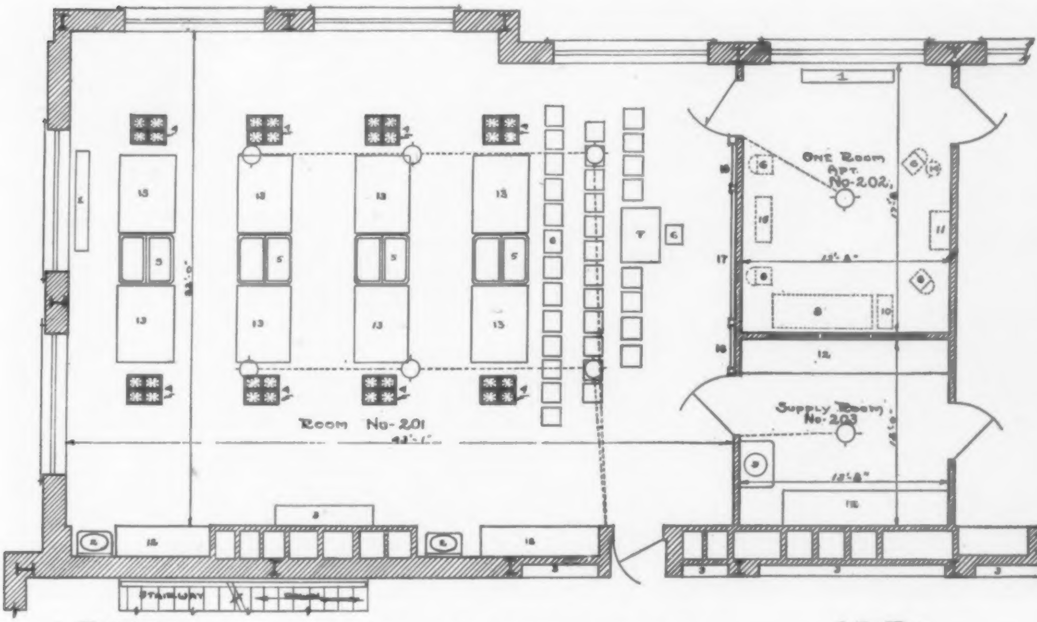
light is well diffused and remains fairly constant throughout the day. If artificial illumination in these rooms is necessary, only the most modern lighting should be accepted.

Size of Laboratories

The size of the laboratory is dependent, first, upon the number of students to be taught. Some people feel that 16 should be the maximum number of pupils, others 20, some 24, 30, 32, or 40. As soon as the number is fixed, consideration should be given to the size of the room, desirable equipment, and its arrangement. If 20 pupils are planned for, the clothing room should be 31 feet 4 inches x 23 feet. The foods room, if the hollow square arrangement is used, will occupy a space equivalent to that of the clothing room, but if the unit desk arrangement is used, a little smaller space will suffice—a room 30 feet 6 inches x 23 feet. The unit kitchen plan will need a room a trifle larger than the hollow square or the unit desk arrangement, or a space 33 x 23 feet. No aisle next to a wall should be less than 3 feet wide, and no inside aisle less than 2 feet wide. The



THE FOODS AND CLOTHING LABORATORIES OF THE McKINLEY ELEMENTARY SCHOOL, TOLEDO, OHIO



HOME ECONOMICS ROOM
WOODWARD HIGH SCHOOL
TOLEDO, OHIO

space between the tables in both the clothing and the foods laboratories should not be less than 2½ feet. The space should be economically planned, but it should not be parsimonious in its working requirements.

Minimum Features of Clothing Laboratories

The minimum building features of this room are at least one garment closet deep enough to permit clothes hangers; compartment lockers sufficient for each girl to have her own locker; one long cutting table; one sewing machine for at least two girls, preferably one for each girl; one ironing board which folds into the recess of the wall; an electric iron arranged in a metal-lined drawer; plenty of blackboard space; a lavatory; a bulletin board; a teacher's desk; and a laundry immediately adjoining the clothing room.

Foods Laboratories

The foods laboratories may be one of several types—the hollow square, the unit desk arrangement, or the unit kitchen.

Some supervisors and teachers of home economics favor the hollow square with sufficient sink facilities and openings so that access to the supply table is easy. Many people favor the unit desk arrangement where a sink is provided for every two girls.

The unit desk arrangement—by some called modified unit kitchen—makes perhaps the most economical use of space. It provides for all pupils ample light from the windows to their left; also it promotes individual responsibility and

THE CLOTHING LABORATORY IN THE WOODWARD HIGH SCHOOL, TOLEDO

THE HOLLOW SQUARE ARRANGEMENT IN THE FOODS LABORATORY OF THE PHILLIPS HIGH SCHOOL, BIRMINGHAM, ALA.

gives the teacher an opportunity to receive immediate attention from all the pupils. Its disadvantages are: the teacher cannot see all the individual work at once, as she can in a hollow square; two supply tables are required, one at each end of the laboratory; and the cost of plumbing is increased. However, this type of kitchen is used in a number of cities; in fact, it is generally used in the United States.

The object of the unit kitchen is to reproduce in the school, as nearly as possible, the home kitchen. There are many types of unit kitchens in the United States.

The unit kitchen is designed for junior and senior high school work. It requires a sink, a stove, a table, and a kitchen cabinet. The usual space allotted to each kitchen is 9 feet 4 inches x 9 feet, or 84 square feet. In addition, there are a teacher's desk, a supply table, and the refrigerator, unless there is electric refrigeration. These occupy a space equivalent to one of the unit kitchens. There should be space for a built-in towel closet.

THE FOODS LABORATORY OF THE ROOSEVELT JUNIOR HIGH SCHOOL, MILWAUKEE, WIS.

The tables and other equipment in the unit kitchens are movable. With the hollow square and the unit desk arrangement, it is desirable to have a regular home kitchen. This is obviated by the unit kitchen, which probably makes it the most economical use of floor space, because its 739 square feet of floor can be made to serve either the hollow square or the unit desk arrangement with its additional kitchen and storage room. In the hollow square this amounts to an equivalent of 894 square feet, and in the case of the unit desk arrangement to 876 square feet.

The best plan is to have the stoves and sinks arranged along the walls in order to make the plumbing and gas pipes accessible and yet have them out of the way to make room for vent pipes for gas stoves to run up the wall and

HOMEMAKING EQUIPMENT IN GRAMMAR SCHOOL NO. 15, PATERSON, N. J.
Bedroom, dining room, and living room behind the partition; lecture unit of arm chairs to the right of the cupboard

connect with horizontal pipes near the ceiling, which in turn connect with vent flues. To get the full benefit of light, it is well to have stoves with raised ovens on the side of the wall without windows, and stoves with ovens below on the side with windows, and sinks below the windows. In most school buildings the sinks are 3 feet above the floor.

The Homemaking Room in Elementary Schools

Portland, Ore.

A homemaking room in an elementary school of Portland, Ore., consists of one laboratory, one dining room, and one pantry.

The laboratory, which is 28 x 35 feet, is used for both food and clothing purposes. It has three work tables, each 42 inches wide x 10 feet long,

THE HOMEMAKING ROOM IN AN ELEMENTARY SCHOOL IN PORTLAND, ORE.

and a cutting or supply table 3 feet wide and 10 feet long. All the table tops are covered with linoleum, and every side of the work tables has four drawers for cooking utensils. The drawers are locked by one key, which it is well to have in the possession of the teacher. The cutting or supply table has three drawers about 9 inches deep on the side facing the front of the room. The space between the work tables is 4 feet x 6 inches. The ranges may be placed nearer the tables if necessary. The opposite side walls each have two sinks. A small cupboard for cleaning materials is placed next to each sink. A movable drinking spigot is on each faucet. Six cupboards are placed on opposite sides of the room under each long counter. These cupboards are used by the cooking partners to store dishpans and large individual equipment. For general cooking utensils, a cupboard 5 feet wide and 6 feet high is placed at one of the side walls. It has paneled doors above and below, and a long counter extends over the lower part.

One sewing cupboard with drawers underneath is near the front doors. This cupboard has 18 16-inch square pigeonholes, which are used for clothing patterns. In an average-sized building which has four class sections, 80 sewing lockers will be fairly sufficient. In small buildings fewer lockers are needed. The device for locking these lockers in rows is not satisfactory, neither are individual keys satisfactory. A new device is needed which will not get out of order easily. One ironing board is built in, with a safety device for an electric iron socket. One bulletin board is placed near the entrance for illustrative material and directions for housekeepers, etc. Twenty-four molding boards 18 x 28 inches are placed under the counter, and sewing machines are placed 35 inches apart at right angles to the windows.

The combined dining room used also as a fitting room is 11 feet 6 inches x 15 feet. It has a mirror built in the side walls where light does not strike it directly; a built-in buffet, above it a china closet with glass doors, and below it drawers for linen and dining-room accessories; a teacher's closet for her wraps and street dress; and another closet with several shelves for charts, other exhibit material and general use.

The pantry is 7 feet 10 inches x 10 feet 6 inches. It is equipped with cupboards, drawers, bins, cooler and towel rack, with a window or shaft ventilation.

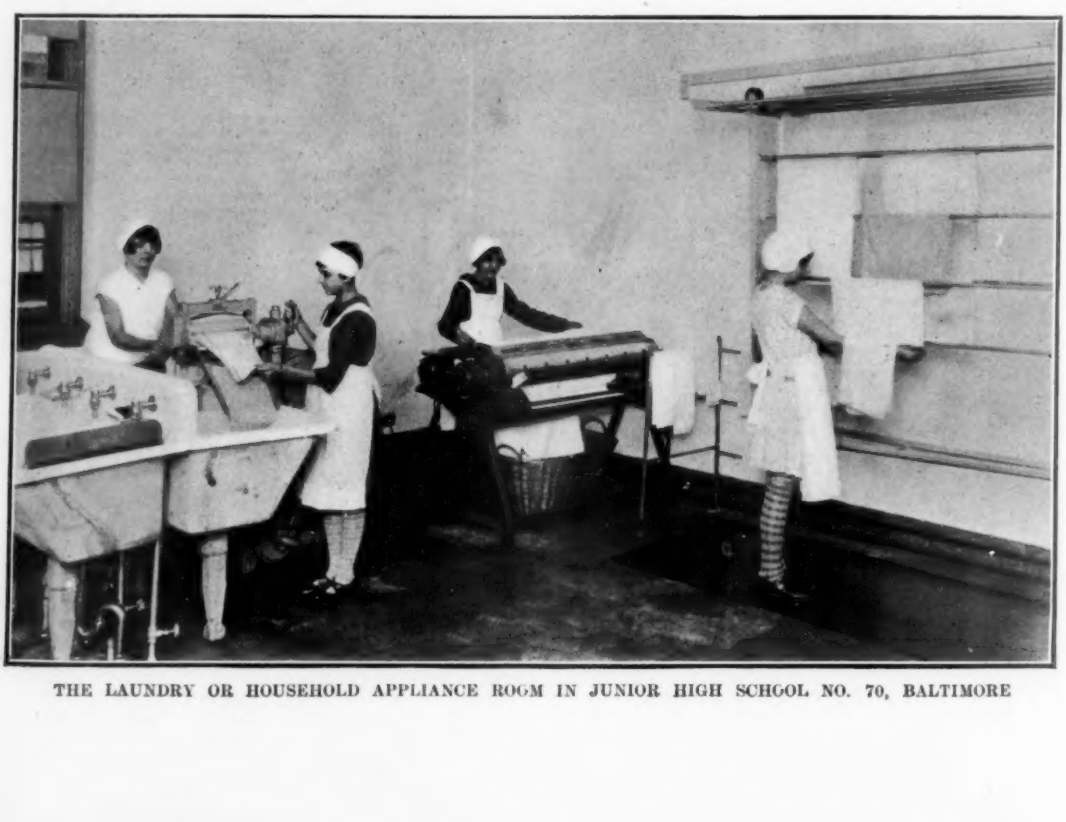
Long Beach, Calif.

HOMEMAKING ROOMS IN FIFTH AND SIXTH GRADES

The homemaking room designed for the fifth and sixth grades of the Whittier Elementary School of Long Beach, Calif., is 25 x 48 feet. This room is equipped for food, clothing and simple housework. The dimensions of this type of room differ from 23 x 32 feet, room unit of the average sized classroom, to the above floor space allotted for this particular type of work.

On the long inside wall of this room are a lavatory, two sinks with tiled drainboards, over which are cupboards, a laundry tray at the end of each sink, and a ventilated apron and work box lockers. The storage facilities for the homemaking room are provided for by "built-ins." These obviate extra partitions needed for closets or pantries, thereby reducing the initial building cost and facilitating the routine of storing and distributing supplies. At one end of the room is a "built-in" that occupies a space of 15 feet and is used for sewing supplies, hangers, shelves, drawers, the paper roll, and cupboards. A mirror is in the door panel of the "built-in."

A "built-in" at the opposite end of the room is for kitchen purposes. It includes a cooler, a towel drying closet, cupboards, a broom closet and drawer space for food supplies and utensils. The towel drying closet has proved most satisfactory in drying towels yet keeping them out of sight. The ventilation of this closet is from above and below, and specifications for it were included in the architect's plan. The closet has 15 movable rods supported by slanted cleats. It has double doors, making access convenient. A space of 25 x 36 inches with 18 inches between the cleats is sufficient for 45 towels. The rods should be at least one inch in diameter and finished in a manner to



THE LAUNDRY OR HOUSEHOLD APPLIANCE ROOM IN JUNIOR HIGH SCHOOL NO. 70, BALTIMORE

UNITS OF STORAGE CLOSETS IN THE HOMEMAKING ROOM OF THE WHITTIER ELEMENTARY SCHOOL, LONG BEACH, CALIF.

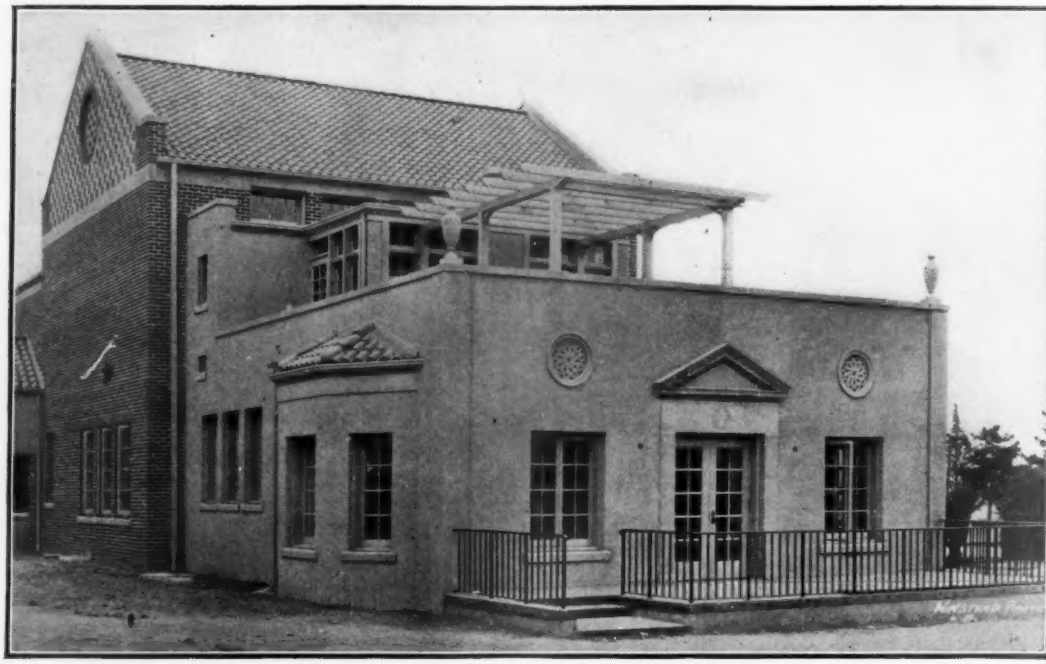
The storage closets occupy a space of 15 feet, which allows wardrobe, drawer and shelf accommodation for the end of the room which is used for sewing classes. A mirror is to be placed in the door panel at the left

prevent mildewing or warping from damp towels. The floor of the dryer is covered with linoleum or some other material that is not affected by the drippings from towels. The ventilated cooler is part of every home kitchen equipment in California. In the school kitchens, it may be placed next to the towel dryer.

The foods laboratory tables are built in the carpenter shop of the Long Beach schools. These tables, after considerable experimentation, have been built to fit the needs of the elementary, junior and senior high school classes. They vary, however, in different schools according to the height needed and the finish desired. Three kinds of top surfacing have been tested—enameled iron, a magnesium, and a linoleum composition. The cost of the surfacing is about the same. A complete table 24 x 48 inches, large enough for two pupils, costs about $28. These tables are high enough from the floor for scrubbing under them.

THE HOMEMAKING ROOM FOR THE FIFTH AND SIXTH GRADES, WHITTIER ELEMENTARY SCHOOL, LONG BEACH, CALIF.

The room, 25 feet x 48 feet, is equipped for sewing and cooking classes, and contains two sinks, two laundry trays and one lavatory. The photograph shows the range and movable cooking desk arrangement. This is a typical homemaking room for the elementary schools. Both foods and clothing can be taught in it, as the cooking desks are movable and can be set to one side while machines are put in their places



THE HOMEMAKING BUNGALOW IN THE NEW WING OF THE JEFFERSON JUNIOR HIGH SCHOOL, LONG BEACH, CALIF.

The bungalow contains a living room 15 x 28 feet, a kitchen and laundry, bedroom and bathroom (to be used as a classroom for home nursing and child-care practice)

There is space for stools and, if desired, a rack for notebooks, vanity cases, etc., may be attached at the sides. Molding and cutting boards are provided and the tables if placed back to back form an oblong 4 x 8 feet. They are portable and may be arranged to suit any size or shape of room, and the arrangement may be easily modified. Small gas ranges about which the tables may be grouped are used instead of gas plates set on the tables.

Homemaking Equipment in Junior and Senior High Schools

In providing home economics equipment for junior high schools in Long Beach, as far as possible the educational objectives of the junior high school are observed. That is, provisions are made for greater independence on the part of the student and opportunities for exploration in the various homemaking activities. Therefore, the unit kitchen is introduced with the view of making girls independent of the instructor and of one another, yet providing for cooperation and helpfulness.

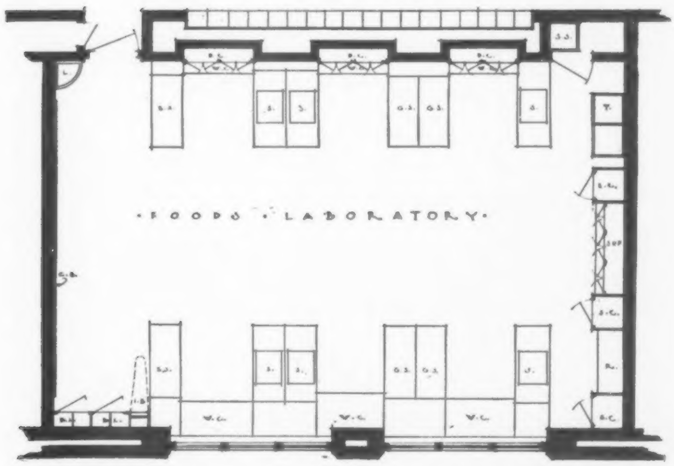
The living room in the Jefferson Junior High School is 15 x 28 feet. This homemaking bungalow has a kitchen, a laundry, a bathroom, and a bedroom. The latter is used for home nursing and child-care practice. The living room has hardwood floors, and paneled walls in which there are closets large enough to store folded tables when not needed for class use. The kitchen has working space for a class of 12 to 15 girls. It has three gas ranges placed side by side. This arrangement is satisfactory with an average class for purposes of meal preparation and serving, by dividing the class into two groups, one group preparing and the other serving the food. Such a plan fulfills the practice house idea and has the advantage over it by caring for the entire class, yet at the same time the conditions of the home are realized.

The larger junior high schools of Long Beach are provided with two sewing rooms, and an extra room for child care and home nursing where household management may be taught. There is sufficient storage room for a portable bed, etc. The bathroom is so built that it may be used for demonstration purposes by having the bathtub placed against the wall, and sliding doors between the lecture room and bathroom. When sliding doors are open, classes seated beyond them have a full view of demonstrations. The child-care and nursing room can also be used as a home nursing room.

South Bend, Ind.

The James Whitcomb Riley Junior High School in South Bend was originally built for junior high school work, but now senior high work is being added, and this particular laboratory is shown in the drawing. It has six unit kitchens each equipped with a range, a sink and a work counter, below which cupboards and drawers provide sufficient room to take care of the ordinary equipment used in the preparation of meals. Because of windows on the one side above these counters, we can provide for dish cupboards only on one side of the room. These cupboards are large enough to hold an ordinary size set of dishes. Additional equipment and dishes can be placed in storage cases. The various cases and cupboards are adapted to various pieces of equipment, such as broom closets. The equipment for scrubbing is kept in a little closet which holds the slop sink. It is the intention to place tables down the center of the laboratory for the serving of meals and to have the laboratory work done in pairs, thereby using one table and dishes in common for serving.

The wall space not used for cupboards has a wainscot of a soft shade of tan brick merging into the yellows. The walls are a deep ivory, and the floor is covered with inlaid linoleum also in the browns, with a touch of green simulating tile. Color to a certain extent is to be used. The plan is to equip each pair of food laboratories in a



THE FOODS LABORATORY OF THE JAMES WHITCOMB RILEY JUNIOR HIGH SCHOOL, SOUTH BEND, IND.

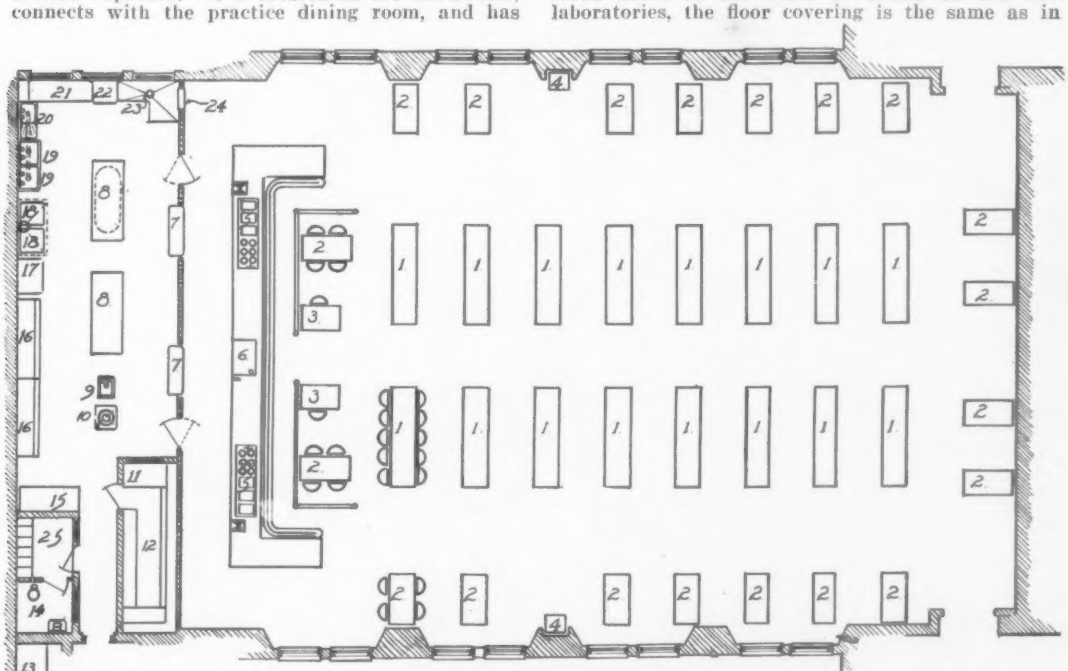
different color; that is, the plan is to have two greens, two blues, and two dull pinks.

Grand Rapids, Mich.

The Burton Junior High School has two foods laboratories, a clothing laboratory, a dining room and a cafeteria. Foods laboratory No. 1 has an eastern exposure. It is located on the third floor, connects with the practice dining room, and has oak woodwork and furniture finished in Belgian gray. The floor is covered with battleship linoleum. This equipment accommodates 24 pupils, although it has often accommodated 32 pupils. It has such labor-saving devices as mechanical refrigeration, laundry tubs, built-in ironing board cabinet, recessed supply and wardrobe case, and oven regulators. The locker space of low drawer cabinets is found to the rear and front of room, and the supply room is shown through the open door.

The unit kitchen foods laboratory has an eastern exposure, and is located on the top floor adjoining the department dining room. The woodwork and floor covering are the same as found in foods laboratory No. 1. It has 6 units accommodating 24 pupils, although 30 pupils have been accommodated. The labor-saving devices are the same as in foods laboratory No. 1. The ranges are elevated, an apartment kitchen cabinet is provided for each unit, and a supply room is in front of the laboratory, where the door is closed. Low drawer cabinets are in each kitchen to serve as lockers for each student's individual equipment.

The department dining room has an eastern exposure and is located between the two foods laboratories. The dining room may be entered from the main corridors or from the two laboratories. The wood finish is the same as found in the two laboratories, the floor covering is the same as in



KEY TO EQUIPMENT.			
1-10' Tables.	7-Plate Warmer.	13-Elevator	19-Scullery Tubs.
2-5' Tables.	8-Cook's Table.	14-Toilet.	20-Sink.
3-Cashier's Table.	9-Sink.	15-Refrigerator.	21-Bench for Clean Dishes.
4-Cooler.	10-Electric Peeler.	16-Case.	22-¼ H.P. Motor Dishwasher
5-Steam Table.	11-Teacher's Desk.	17-Pastry Oven.	23-Bench for Soiled Dishes.
6-Ice Cream.	12-Store Room.	18-Ranges	24-Dumb Waiter.
			25-Locker Room.

THE BURTON JUNIOR HIGH SCHOOL CAFETERIA AND KITCHEN EQUIPMENT, SOUTH HIGH SCHOOL, GRAND RAPIDS, MICH.

CAFETERIA NO. 5 (TWO-WAY SERVICE), IN THE HOME ECONOMICS DEPARTMENT, BURTON JUNIOR HIGH SCHOOL, GRAND RAPIDS, MICH.

the foods laboratory and it has a built-in china closet.

The clothing room has a western exposure, located on the third or top floor directly across from unit kitchen 2. The finish of the woodwork and furniture is the same as found in the foods laboratories, and the floor covering is the same. This laboratory will accommodate 38 pupils. The room has two electric and six regular stand machines. In the rear of the room are two small rooms, one for storage and one for a fitting room. To the left and in front of the room is one large cutting table. There are two built-in ironing-board cabinets. The room has a sliding blackboard to the front, two bulletin boards, one on each side of the blackboard; the tables and chairs are movable, therefore this room lends itself nicely to child-care classes, student club programs and other school activities.

The cafeteria in this building has a north and south exposure. It is located on the third and top floor directly across the corridor from the foods laboratory. The finish of the woodwork and furniture is the same as found in the other rooms. The floor covering is the same. It holds 450 persons. There are two water coolers, one on the north and one on the south wall.

Houston, Texas

Four new Junior High School buildings were built in Houston in 1925-26. In each, provision was made for a first-floor home economics department composed of a foods laboratory, a clothing laboratory, and a small apartment with space for a living-dining room and a bedroom. Equipment was planned to take care of 32 pupils per class and 6 classes per day.

The foods laboratory floor space is 55 feet 10½ inches long, and 24 feet wide, an allotment of 42 square feet per pupil. Twenty-four individual desks are provided, six sinks, and twelve desk ranges with lower ovens. Thus each student has her complete working unit consisting of her table with an adjacent stove and sink. To provide further for homelike working conditions, two unit kitchens were planned: one equipped with a kitchen cabinet base, and a gas range with oven control and sink cabinet; the other with a tall kitchen cabinet, electric range and sink cabinet. The special sink cabinets divide the two kitchens and provide each unit with its sink, storage space for china and utensils and laundry tubs.

There are built-in cabinets in the pantry for china, cleaning equipment, apron lockers, and the storage of large equipment. More apron lockers and a cabinet with drawer space for linens and silver, and shelves for china, were placed in one end of the laboratory. Individual table tops are of white porcelain-enamel — impervious, easily cleaned tops which give

THE UNIT KITCHENS AT ONE END OF THE FOODS LABORATORY IN THE SIDNEY LANIER JUNIOR HIGH SCHOOL, HOUSTON, TEXAS

promise of being very durable. Double supply tables centrally located facilitate the measuring of supplies and are a factor in the speed necessary to the completion of a cooking project in a 45-minute period.

An ironing-board cabinet and a refrigerator complete the general equipment of the foods laboratory. A gray-green stain finish was used throughout.

The clothing laboratories are oblong rooms 52 feet 4 inches long by 24 feet wide, with fitting rooms 9 feet square jutting out into the room. Thus two regular classroom spaces could be used without interfering with the general plan of the building. In order to provide the table and locker space necessary for 6 classes per day of 32 pupils each, an especially designed table was made. Each table is 6 feet long by 30 inches wide, with an 11-inch drop-leaf for cutting purposes. Six master-keyed lockers and double open spaces for wall lockers are provided in each table. Slotted spaces at the side are used for books, so that all of the table surface is clear for cutting and sewing. One hundred and eighty-two lockers take care of the situation so well that the teachers have had no worries from lost or stolen work. This adds greatly to the pleasure of the teachers and pupils in their work.

A DEMONSTRATION AND LECTURE ROOM IN A HIGH SCHOOL, DETROIT, MICH.

A key board with reversible leaves, three cabinet ironing boards, a cheval mirror, a fitting stand, a costumer, glass display cases, and seven sewing machines, complete the equipment in each sewing room.

After three years of use the equipment seems to be satisfactory from various viewpoints. It provides adequate working and storage space, is easy to use from the standpoints of both the teacher and the pupils, and seems to be sturdy enough to wear very well indeed.

Detroit, Mich.

CLOTHING LABORATORY

The clothing department of the Intermediate Schools or Junior High Schools consists of two rooms: each one accommodates 35 students, and the fitting room is between them.

Sewing Room—Movable Furniture

A. 18 sewing tables, each to accommodate two students. These tables are 5 feet long, 2 feet wide, and 31 inches high. Each table contains two open spaces for locker drawers. Each space is 12½ inches wide, 20½ inches long, and 5 inches deep. Also two small drawers, each 6½ inches wide, 20 inches long, and 5 inches deep, in which small equipment may be kept. Price, $35.

B. 2 cutting tables. In the first equipment two were allowed, but it was found possible to get on nicely with one. These tables are built with locker drawers underneath to accommodate 60 students. The table is 72 inches long, by 44 inches wide, by 39 inches high, with laminated cork top and 3-inch oak edge. On the next tables, which will not be locker type, but regular style tables with two drawers, battleship linoleum will be used. The cork seems to loosen and come out in pieces.

The reasons for the change in style are: (1) the tables are expensive—$234; (2) it is very hard to keep table from sagging at top by being pulled down by weight of drawers.

C. 45 chairs at $3.60 each.

D. 10 sewing machines at $30 each.

E. 1 teacher's desk at $24.50.

F. 1 teacher's chair at $4.90.

Sewing Room—Built-in Furniture

A. Student drawer cabinet, made of sections, each to contain 26 drawers, the sections varying according to wall space and classes expected. These drawers, as well as the drawers in the cutting table, fit into the open spaces in the sewing tables. The student may use this drawer as a storage place in class and as a locker in the case.

Each section is covered by sliding doors which lock. Three kinds of doors have been tried: (1) rolling top; (2) sliding glass; (3) sliding wood panels. The ones in use make the best appearance in the room. Price of this case, $460 for 16 feet or 7 sections.

B. Display case 63½ inches wide, by 7 feet long, by 30 inches deep, with sliding glass doors. A brass rod is put through center of case on which garments may be hung. Price, $100.

C. Classroom cabinet, for display and storage. Each cabinet consists of two sections, each containing three shelves at the top, with four small drawers and two large drawers at the bottom. Glass doors in front of shelves. Price, $365.

D. Bracket lamps with adjustable, movable arms to be used over sewing machines on a dark wall space. These are to be discontinued because the light now is adequate for the room.

There are also a blackboard and a cork board. It has been found that built-in equipment is much less expensive on account of finish at back, sides, etc. Great care must be taken, if two different contractors build sewing table and student drawer cabinets, that drawers and spaces fit each other.

The Fitting Room

The movable furniture in the fitting room consists of a draping stand and a draping stool; the built-in furniture of three triplicate folding mirrors (price, $160), two ironing boards with wall cabinet (price, $40), and one lavatory with hot and cold water.

FOODS LABORATORIES

The intermediate cooking unit consists of two kitchens with a common pantry between and an apartment consisting of dining-room, bedroom, bath-

room and kitchen; each kitchen to accommodate 24 girls.

One room was equipped as a unit kitchen. There were three units, each 10 by 12 feet, set off by a 6-foot-high partition with open front; each unit consisting of range, sink, and table. The partition is to be lowered to 4 feet. Eight tables were in unit arrangement in the main part of the kitchen, also range-sink unit with laundry tub.

The other kitchen was in unit arrangement of tables, each to accommodate four students.

The unit kitchen arrangement by partition was discontinued because it interfered with the supervision of the conduct of the class and it was found very difficult to bring the class together in a social group for discussion. The new plan is with the unit arrangement of tables in both rooms, each to accommodate 35 students. The unit will consist of either one double table or two single tables back to back to accommodate four students. Hot plates are flush with the table top. In one kitchen a stack of ovens is used which is proving very satisfactory, and in the other a range with double oven. In each room there are two units of laundry tubs and sink next to wall.

The newest plan is for two double tables with two ranges between and sink at the end; this unit to accommodate eight students. This plan has not been used before on account of necessary flues called for in the building code, which would have made a row of ugly-looking pipes in the room. These have been taken care of by the engineering department by a series of flues placed in the floor.

Composition top tables have proved very satisfactory.

The apartment consists of:

1. Bedroom containing hospital bed, chiffonier, small rocker, straight chair, table, waste receptacle, first aid Red Cross kit, and rug. This room is used for teaching first aid, bedmaking, care of equipment, and for emergency service in the school.

2. Dining room—table, 6 chairs, rug, and built-in buffet. This is used for teaching service of meals and for special occasions.

3. Bathroom—usual fixtures.

4. Kitchen—range, table, sink, built-in cupboard and small equipment. This is used for preparation of meals that are served in the dining room.

In the first group of schools a separate room was provided for laundry work, which included as equipment six stationary tubs, six ironing boards, and irons and attachments, washing machine, dryer and gas attachment for hot plate dryer. The washing machine and dryer were never provided (no funds).

In the next group this separate room was not allowed because of its not being used 100 per cent of the time, so a laundry unit was built into the end of the kitchen, consisting of four tubs, two ironing boards for demonstration purposes only. This same arrangement is to be used in the new building.

The last high school equipped was in the unit type kitchen, the partitions being 4 feet high. This has proved quite satisfactory to both students and teachers. If new cosmopolitan high schools are equipped, we should use the latest intermediate equipment.

The latest elementary school arrangement is unit arrangement of tables, which really forms a hollow square. Also two units of sinks near the wall with laundry tubs and range.

Milwaukee, Wis.

The Walker Junior High School opened in September and, while it is the newest junior high school, in equipment and arrangement of room it differs little from what is now becoming standard for Milwaukee.

Two foods laboratories are located on the ground floor with a west exposure, and are large, bright, airy rooms, equipped to care for 32 pupils. The arrangement of the fixed equipment is of the semi-unit type, each table containing the utensils and staple supplies for four girls. Between the two foods laboratories are the dining room and storeroom with doors opening into each classroom. Wheel carts are used to carry supplies from storeroom to foods laboratory. Pupils from either room can use the dining room for actual meal serving. Girls are born with a sense for hospitality and they have plenty of opportunity to gratify this desire in serving simple breakfasts, lunches, and dinners in their attractive dining room. Whenever possible, a teacher is invited in as a guest, and on cold, wintry days the girls love to send around an invitation to the teachers to gather here for a cup of hot tea. The principal, too, finds this a quiet place to hold luncheon conferences, or entertain guests. The cafeteria is directly across the corridor, so food can conveniently be sent in and served by the girls. Every seventh and eighth grade girl is required to have five periods per week of the homemaking work, and that they like the work is shown by the number who select Household Arts as an elective in the eighth grade.

Most of the food used for the noon lunch is prepared in the cafeteria kitchen, but for the eighth grade elective we arrange the course so that the girls each week prepare some one dish that is, if up to standard, sold in the cafeteria. The girls like working with a standard size recipe and work hard to make their product "good enough to sell."

The laundry is complete as to home equipment. The girls learn how to use and care for the now common appliances found in most modern homes. We do not think it as important for the girls to do the actual laundry work as to have them understand how it should be done, so they may intelligently in-

THE HOMEMAKING ROOM IN AN ELEMENTARY SCHOOL IN DETROIT

THE CLOTHING LABORATORY OF THE WALKER JUNIOR HIGH SCHOOL, MILWAUKEE, WIS.
Standard sewing tables, storage lockers and exhibit cabinets are used

struct others regarding the best methods of laundering textile fabrics.

On the third floor are two sewing laboratories, a fitting room planned not only for use as a fitting room but to hold the individual lockers and storage cabinets for students' work. Between the two laboratories is a shrinking room, fitted up with a small chemistry demonstration table, bunsen burner and sink, where textiles may be tested, and materials shrunk and dyed.

The sewing laboratories are equipped for 36 students using a four-student type of table. We are trying to standardize our equipment and use the same table for both foods and clothing laboratories, substituting drawers in the sewing tables for the cabinets in the cooking work table.

The course in clothing prepares the girl not only to make her own clothing but to know how to select appropriate dress; to know what colors she can best wear; to know something of line and design as it relates to her own self; to care for and keep in repair her clothes, as well as to know something of the cost of her clothes. Each girl keeps a notebook and a clothing budget for the three years of her junior high school course. In this way the girls realize something of what their parents actually spend on them each year.

Opening out of one sewing laboratory is our homemaking room. Here the girls have their work in infant hygiene and care of the baby. All learn how to make a bed and care for their own bedroom.

All household arts rooms are fitted out with generous bulletin and blackboards. We also have a picture molding around all rooms for use in displaying exhibits or work of the students. Every convenience that has seemed practical we have installed, and nowhere, I think, will be found better equipped, lighted or ventilated rooms.

Trenton, N. J.

Junior High School No. 4, in Trenton, is built to care for about 1,800 pupils of seventh, eighth and ninth grades. The home economics rooms are desirably located on the second floor, forming an L unit on two adjacent sides of the building, (separated by a stairway near the corner). They are very well lighted (both naturally and artificially), and well ventilated, and have splendid equipment and storage facilities for instruction and practice in many homemaking activities, such as food needs, choice, purchase, and preparation, nutrition, meal planning and serving; clothing needs, choice, construction and care; laundering, home nursing, child care and rearing, home management, family relationships, entertaining, home decoration and furnishing, economics of the home, etc.

These rooms are each supplied with sufficient blackboard and bulletin board space and the type of closets necessary for the work carried on there.

NUMBER, TYPE AND SIZE OF ROOMS

A. Two clothing and household sewing rooms, about 37′ x 24′ each
   - One fitting room 11′ x 10′ between the rooms
   - Supply and equipment storage space 11′ x 2′ (divided into small closets reaching to ceiling) between the two rooms
   - Sliding-door space 19′ x 2′ divided into glass door exhibit case and solid door closets for storage of pupil work boxes

B. One laundry about 28′ x 24′
   - One closet 3½′ x 2½′ (inadequate)

C. One homemaking and housewifery room, 28′ x 29′
   - One closet 3′ x 4′
   - Two closets 4′ x 2′

D. One apartment
   - a. Living room about 16′ x 15′
   - b. Dining room about 12′ x 12′
   - c. Bedroom about 12′ x 12′
   - d. Bath about 5′ x 8′
   - e. A unit of foods laboratory is used as the kitchen for this apartment.

E. Two foods rooms, about 41′ x 25′ 9″ each
   - Additional storage space of about 7′ x 25′ for each room divided into closets for supplies and equipment

These rooms are efficiently equipped for class units of 36 pupils, with sufficient electric outlets to make possible the use of varying types of electric labor-saving and furnishing devices. (The laundry and apartment are used as auxiliary rooms where small groups work one at a time. It is possible to plan work for one-half of the class unit in the laundry, when several activities can be carried on at one time. The most efficient work in the apartment is usually done when the group working there is limited to three or four—occasionally six, depending upon the activities carried on—unless

some social or family relationships phases of homemaking are receiving emphasis, in which case it is possible to have larger groups.)

It has been planned to make possible a condition for pupil experience with real problems and conditions which will be favorable to the development of home economics standards of thinking and doing, and to a critical evaluation of time- and labor-saving devices and methods, to the end that the pupils may realize that these household activities are a joy rather than a drudgery. It has been kept in mind that wear and tear is much greater with the numbers using this particular equipment than would be with the few individuals in any one family, and equipment has been supplied which would stand that wear; at the same time effort has been made to develop ideals that can be carried into the home life of the pupils.

The storage rooms and closets have been planned to make possible an orderly, easily accessible and safe storage of the equipment and supplies necessary for carrying on the great variety of work found in any well-managed home, and also to care for the pupils' work which must be laid aside at the end of the period.

LAUNDRY EQUIPMENT IN THE HOME ECONOMICS DEPARTMENT OF JUNIOR HIGH SCHOOL NO. 4, TRENTON, N. J.

A. Clothing and household sewing-room equipment (each room)

1 belt punch.
38 chairs (pupils). Seat height 16". Back height 14½".
2 chairs (teacher and visitor). Seat height 18".
1 desk (teacher), flat top.
5 dress forms, sizes 12-, 14-, 16-yr.
1 ironing board with sleeve-board attachment. (Additional portable boards borrowed from laundry when needed.)
1 iron, electric. (Others borrowed from laundry when needed.)
1 lavatory.
1 motor for sewing machine.
24 millinery hat stands (heights varying from 12" to 5'.
1 mirror—cheval.
1 pinking machine.
12 stools for use at sewing machines. Height, 18".
10 sewing machines (foot power).
1 sewing machine—electric.
1 stand, fitting; 18" square x 2' high.
2 screens (four-fold; each panel 68" x 19", double burlap).
1 skirt marker.
21 T squares.
1 Tommy iron, electric, with attachments for upright and flat work.
18 tables, pupil work tables; heavy bolt reinforced construction, heavy base and top, 4' x 2' x 30". (Five-foot tables more desirable, but crowd these rooms.) Two drawers, 15½" x 18" x 3". These tables are easily shifted and grouped for varying types of work and make it possible to arrange seating areas so that every pupil has the advantage of light from the left.
1 table, cutting, 6' x 3' x 3', with drop leaf 21" x 3', heavy bolt reinforced construction.
1 wire press board, 8" x 24", for nap materials.
24 yardsticks.
(Small equipment not listed.)

THE DINING ROOM AND LIVING ROOM OF THE HOME ECONOMICS APARTMENT IN JUNIOR HIGH SCHOOL NO. 4 IN TRENTON

B. Laundry equipment

1 cabinet—broom unit
1 cabinet—shelf unit
1 cabinet—kitchen
1 cabinet—steel office storage, five adjustable shelves size 6' x 3' x 18"
2 chairs (teacher-visitor)—seat, 18" high
2 clothes-trees—36 folding arms
2 clothes-horses, 5 ft., four-fold
1 dryer—interior gas heated, 6' x 6' x 20½"
1 ironing board with sleeve-board attachment
6 ironing boards—folding portable
6 irons, electric
1 lavatory
1 mangle, electrically operated and heated
1 range, laundry, three giant burners, height 21" to 24", top about 32" x 12"
8 stools—height 18"
12 tubs, porcelain
4 tables, kitchen, porcelain enamel, 40" x 25" x 30"
8 washboards
3 wash boilers

2 wringers, reversible type
1 washing machine and wringer, electric suction type

C. Homemaking and housewifery room equipment

(A recitation, demonstration and activity room for all types of homemaking work. At present used as an academic classroom entirely.)
2 cabinets—kitchen
1 cabinet—broom unit
1 cabinet—shelf unit
38 chairs—pupil, height of seat 16", height of back 14½"
2 chairs—teacher-visitor, height of seat 18"
2 clothes-trees—36 folding arms
1 desk—teacher—flat top
2 ranges—table, two single and one giant burner, oven 18"
2 double sinks
2 tables, kitchen, enamel porcelain 40" x 25"
20 tables, 4' x 2' x 30", same as those in clothing room

D. Apartment equipment

a. Living room
1 andiron set—black dumb-bell
1 desk—spinnet
1 chair—Windsor—desk
1 end table and book trough
1 fireplace set
1 fireplace screen
1 floor lamp
1 rug, 11' 3" x 12'
1 table—gate-leg side table
1 three-piece suite—davenport and two chairs, overstuffed
1 waste basket
1 electric cleaner

b. Dining room
1 buffet
6 chairs—Windsor
1 gate-leg table—extension
1 rug, 9' x 9'
1 tea wagon
China, glassware, silver and linen for meal service

c. Bedroom
1 bed, 3' 3" with necessary equipment, including mattress, spring, pillows, and coverings
1 chest of drawers
1 dressing table
1 dressing table bench
1 easy chair
1 rug, 9' x 10' 6"
1 bedside table
1 waste basket

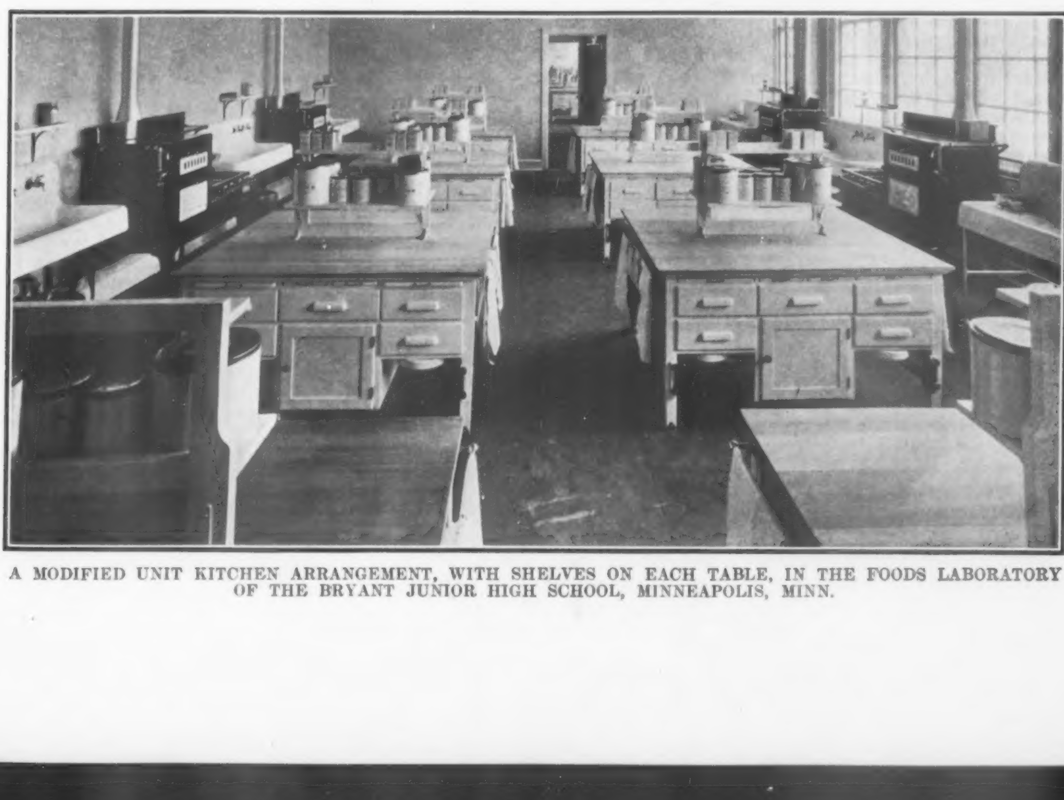
d. Bathroom
Small tub, toilet and lavatory
Built-in medicine cabinet with mirror
Fixtures for towels, soap, glass
Stool
Hamper

E. Foods rooms equipment

To furnish an ideal home working unit for each individual in a class is prohibitive because of expense. We arrange our rooms in nine unit groups, each containing domestic cabinet, table, range, double sink and additional storage space when possible. If the additional storage cannot be in the unit, the storage at the end of the room is used. Here family groups may work in as near home conditions as can be arranged in a laboratory. We do not use partitions or rails to divide these units, but arrange the furniture to make a homelike grouping, and at the same time keep in mind the teacher who wants to keep in close contact with the work of all units.

Although a better-looking room could be arranged if low ranges were installed, we use the cabinet range because we have learned how much energy is saved if one does not stoop for oven work.

1 cabinet—broom unit
1 cabinet—shelf unit
4 clothes-trees—36 folding arms
2 chairs—teacher-visitor—height seat, 18"
1 desk—teacher—flat top
2 dish trucks, two trays, 38" x 21" x 23"
1 fireless cooker, electric; 1 fireless cooker, non-electric; shared by two rooms
1 ironing board
1 iron, electric
4 kitchen cabinets, 36"
5 kitchen cabinet base, 42"
9 ranges—cabinet
a. 6 cabinets; insulated ovens, thermostatic oven control; 14" and 18" ovens
b. 3 chambers fireless; one and two thermodome sizes
1 refrigerator—side icer, 47" w. x 24" d. x 56" h. (Can be electrically equipped. Would use electric if equipping today.)
9 sinks, double compartment, set at varying heights
40 stools, seat height 18"
10 tables, kitchen, enamel, porcelain, 40" x 25" x 30"
Additional small equipment such as china, cutlery, glassware, utensils, etc., for family meal preparation and serving, and tools for housewifery work included.



A MODIFIED UNIT KITCHEN ARRANGEMENT, WITH SHELVES ON EACH TABLE, IN THE FOODS LABORATORY OF THE BRYANT JUNIOR HIGH SCHOOL, MINNEAPOLIS, MINN.


THE DINING ROOM OF THE HOME ECONOMICS DEPARTMENT IN THE MARSHALL HIGH SCHOOL IN MINNEAPOLIS

Minneapolis, Minn.

The foods laboratories have been changed very decidedly in the new buildings, on account of two causes:

1. Changing the length of the period from ninety minutes to sixty minutes.
2. Increasing the size of the classes from twenty-four to thirty-two.

The width of the laboratory is fixed by the state law—23 feet. The length depends upon the equipment installed. All floors are covered with battleship linoleum, dark brown.

There are two types of foods laboratories—the hollow square and a modified unit kitchen. Both have advantages and disadvantages. The hollow square costs less money and is easier for the teachers. The modified unit kitchen is more like home conditions, and the children prefer to work in this type of kitchen.

The hollow square arrangement accommodates 32 girls. The range and bank of four ovens are equipped with heat regulators. The tables have heavy cast aluminum tops. These are put on by the school carpenter shop. Each small sink has an aluminum splasher. It was next to impossible not to spill water without this protection. The shelves above the sinks are for cleaning supplies. Above the blackboard is a strip of cork board. This is useful to display charts, both commercial and those prepared by the pupil. The small stoves have burners exactly like those of a gas range. The gas dryers have proved most useful. When cooking laboratories came out of the basement, there was not room for the clothes bars. With a different class every hour, towels must be dried somewhere; so the gas dryers were installed. They have an electric fan that keeps the air in circulation.

The first modified unit kitchen. With hour periods, as much equipment and as many supplies as possible must be on each table, so shelves were put on each table. They were very satisfactory in a laboratory equipped for 24, but when they were put in a laboratory equipped for 32, the teacher could not see the girls in the back of the room.

With more and more equipment being kept in the pupils' desks, a cupboard was added and the attached stools. The attached stools have advantages: (1) they are quiet; (2) it is much easier for the janitors to clean. (With hour periods, there must be help from the janitors and matrons). It is a disadvantage for the teacher not to be able to gather her class at the front of the room for a demonstration and have them seated.

The last foods laboratory was equipped for 32 pupils. It has the shelves on the tables eliminated, the number of cans increased to 13, but size decreased. There is a double door to the cupboard, instead of the single; not so apt to warp and sag. There has been some difficulty with the towels being brushed off the towel racks. The men found a metal hook and fastened it with a metal chain to the rack. Each pupil may now fasten her towel and dish cloth so that there is no danger of their being brushed to the floor.

The pantry between two modified unit kitchens has the gas dryer, the dumb waiter and the ice box with an automatic refrigerator. The pupils rinse out their towels, and when the towels are dry they are used over again, if clean enough; if not, they are sent to a commercial laundry. The dumb-waiter is most convenient. All the supplies for the food classes are ordered from the lunchrooms and are sent up on the dumb-waiter. A large amount of the food cooked in the foods laboratories is sent to the lunchroom. When the department came out of the basement and was placed on either the first, second or third floor, the ice man was found a nuisance; hence the automatic refrigerator.

The dining room is located between the foods laboratories and off the pantry. It is equipped for twelve. The furniture was all remodeled.

The clothing laboratories are 23 feet wide and long enough to hold eight large tables, demonstration tables and eight sewing machines. Each table is large enough to have drawers for 24 pupils. On the hour plan it is better to have all sewing equipment and materials under construction at the table where the pupil sits, as it saves time. Each table has two built-in yardsticks. The wall space is divided into three divisions—cork board, blackboard and cork board. The storage cases form one wall of the fitting room. They contain textile trays which may be taken out and hung on books.

The ironing board is out in the room because of fire hazard. This is necessary and wise, especially where the clothing room is in use daily by many students of various age levels and development.

Dining-Hall Maintenance and Management

BY MARY McNEILL OVERHOLT
MORRIS HARVEY COLLEGE, BARBOURSVILLE, W. VA.

THERE are five fundamental principles in the operation of a well-ordered, revenue-producing school dining-hall: intelligent workmanship; organization; judicious buying; care in arrangement and up-keep; and elimination of waste, including control of overhead.

First, an energetic, intelligent cook, preferably a man, is of vital importance to an institution. The best modern equipment for institutional kitchens is heavily constructed, and is therefore unwieldy in the hands of a woman.

A wide knowledge of practical, wholesome foods, good mechanical ability, and some education are indispensable requisites of a good school chef. There is no objection to more technical training concerning food preparation and butchering, but intelligent ignorance is more to be desired than much learning minus practical judgment.

A Well-organized Staff—Judicious Buying

The second requisite of success is organization. The kitchen force, the serving force, and the cleaning and dishwashing force must be so trained and directed that each unit works with efficiency, economy, and expediency. Organization tends to promote skill and speed, and it is through it that much drudgery is eliminated.

The third element in successful kitchen economics is discriminating and judicious buying. Considerable conservatism and a certain adherence to brands with well-established reputations are necessary, but a buyer must also have an admixture of the spirit of the prospector. He must not be too conservative to test fairly the many new brands of foodstuffs placed upon the market yearly, or to try out new processes for the better preservation of food.

Clean and Attractive Equipment

The fourth contribution to success is a clean, well-equipped kitchen, an orderly, well-stocked storeroom, and an attractively arranged, properly conducted dining-hall. Tarnished silverware, soiled linens, carelessly arranged china and tables, all detract from the best-prepared foods. The element of rowdyism, not uncommon in school and university dining-halls, should be quietly but positively eliminated.

Ordering Food Supplies

The fifth and most important element of a revenue-producing dining-hall is the elimination of waste. The ability to estimate correctly the amount of food required for a given number of boarders over a certain period of time, in order that there may be neither shortage nor excess, is very necessary. An alert watchfulness in connection with left-overs, so that by correct methods of recooking or reheating they may again be made into digestible and palatable dishes—not too much like the original—is very vital.

It is also essential that careful attention be paid to the cancellation of regular shipments of certain foodstuffs, such as meats, butter, eggs, milk, etc., over long or short vacation periods. Such articles as these are usually contracted for over a period of three or four months, and where there is inattention to cancellations, foods will be shipped as usual while students are away in numbers during some holiday period of longer or shorter duration, thus causing either total loss or deterioration of foods.

The Overhead

Too much cannot be said of the value of an accurate knowledge of overhead charges. The failure to take into serious consideration this very vital element of dining-hall success, is the Waterloo of many a food purveyor. Wages, "board and bed" of student help or other employees, heat, lights, water, breakage, up-keep of equipment, transportation charges, laundry, etc., are the skeleton in the pantry of numerous school kitchens. Consideration of the kitchen towel and the dish towel, humble mediums of our civilization though they be, determines to some extent the worldly prosperity of any boarding department.

A great saving in wages may be effected through the wise selection of poor, but capable and conscientious, student help for the less exacting duties of the school kitchen. Such duties as the slicing of bread, the preparation of salads, the dishing-up of foods, the arrangement and serving of tables, the clearing-away of dishes and the emptying-up of left-over food, may all be performed by student help. Dishwashing, polishing of silver, cleaning, etc., can be efficiently and expeditiously disposed of by the lithe-bodied, nimble-fingered, quick-witted youth of our modern schools.

Clever Economies

An important adjunct to a school kitchen is a well-, but not over-stocked storeroom. Its shelves should contain canned goods in both institution and family sizes, so that if a certain number of gallon cans are nearly, but not quite, adequate to the requirements of a meal, a tin of smaller size may be opened to supply the required amount. Even though the smaller-sized tins are purchased

at a slightly higher proportionate cost, the economy is still greater than where a larger can is opened, the contents of which, with the exception of the small amount required, would remain unused and would finally be lost unless combined with some other food and in that way utilized at some future time.

The astute dietitian will enlist the cooperation of the chef in the utilization of all fruits and vegetables left over from breakfast and luncheon for the dainty and delicious salads of the dinner meal. If such fruits as apricots, sliced pineapple, Japanese plums, etc., have been used for any purpose during the day, a considerable amount of juice may always be drained from them. This juice may be combined with some of the commercial pectins and made into the most beautiful and delightful jellies at an astonishingly low cost—six to eight cents per sixteen-ounce glass. Apple parings may also be cooked and the resultant juice combined with juice left from raspberries, blackberries, currants, or cherries which have been used for pie filling, and in this way a great variety of jellies may be produced.

Possibly the greatest of all school dining-hall economies may be effected through a wise utilization of garbage. If the location of a school is such that it is possible for some near-by farmer or dairyman to collect all garbage and magically turn it into gold by the alchemy of a porker's digestive apparatus, the cost of lard, delicate, fresh sausage, savory chops, and sweet, luscious baked hams may be reduced to a vanishing point. I have myself produced these products at a cost of from three to five cents per pound!

The Improvement of Cafeteria Service

SCHOOL cafeteria service has advanced very rapidly in many cities because of the careful study given all phases of the program by directors of the service, by research departments in school systems, and by superintendents of schools. The preparation of organization manuals for the use of school cafeterias has been one of the tasks which a number of school systems have worked out successfully. One of the most satisfactory manuals is that which has been prepared for the school cafeterias of Trenton, N. J., by Dr. Guy C. Gamble, Research Director, working in cooperation with Dr. William J. Bickett, Superintendent of Schools.

This manual covers every phase of purchasing, of record keeping, of management, as well as of the detailed services to be performed. A sample of one of the cafeteria service sheets is given below. This shows the degree to which attention has been given to details. This particular service sheet is concerned with the "Care of Supplies." It will be noted that the problems involved in receiving supplies, and the care of foods of various kinds after they have been received, are carefully outlined. The detailed instructions are here given.

I. Receiving Supplies

1. Check all goods received for quantity and quality (where possible). Compare items received with original requisition. All points of variation must be brought to attention of supervisor of cafeterias.

2. Perishable foods should be placed in ice chest or cool place as soon as checked, if they are not to be utilized soon.

3. Staple foods which are to be placed in the storeroom must be checked first and then accounted for on the form for Perpetual Inventory under "Received" columns.

4. Ice must be weighed at time of delivery and a daily account made of weight received. Charge is for weight delivered.

II. Care of Foods

1. Perishable or semi-perishable foods, if they are to be used soon after being delivered, should be put in a dry, cool place. Paper wrappings should be removed from meats because of their absorption of juices. Lettuce and other succulent vegetables become wilted by evaporation if there is too great an air circulation over them. On the other hand, crackers and cookies lose their crispness by exposure to moisture. Hence, dry foods need protection from moisture and moist foods from dry air. Similarly, nuts and other fat foods become rancid if stored in a warm place, while low temperatures (freezing) spoil the texture and flavors of vegetables, such as potatoes. Too much light is injurious, causing fruits and vegetables to become over-ripe and many canned and preserved products lose their color.

Weevils and worms develop rapidly in cereal products, dried vegetables and fruits, and nuts. Destroy infected products and thoroughly scald out containers used to store such foods. Butter should be kept cold and in a container which excludes light and stops absorption of foreign flavors. Milk and cream should be kept in a place free from odors, dust, and flies, and at a temperature of 50 degrees F. or less.

Protect cheese by wrapping it in a waxed paper and keeping in a cool place. Keep it in a tight container, preventing its odor from flavoring other foods. Fish spoils rapidly and should be kept, if not used immediately, in the refrigerator in a tightly covered container. Eggs are best kept in a covered container in a dry, clean place where the temperature is not over 60 degrees F. Protect fats and table oils from heat, light, and air. Bread, cakes, and pastries keep well in a tin box or other suitable covered receptacle in order to prevent absorption of moisture.

Such foods as flour, rice, sugar, dried fruits and vegetables, and cereals, should be kept dry and protected from vermin and insects. Dried meats can be well kept in muslin bags hung in a dry, cool storeroom. Tea, coffee, and spices require air-tight containers. Spread soft fruits out in shallow pans, preventing crushing. Oranges, apples, and other fruits can be preserved by being wrapped in separate papers. Fruits and vegetables, stored in boxes or bins, should be frequently inspected and decayed ones removed.

III. Left-overs

1. Left-over foods should be used as soon as possible and be carefully handled. Slices of bread may be used for toasting and pieces for crumbs. Muffins may be reheated. Left-over butter can be saved for cooking purposes. Scraps of meat can be utilized for stews, soups, or salads. Vegetables can be reheated or used for flavoring soups and stews or in salads. Fat can be rendered. Use earthenware containers for acid berries and preserved fruits. Always remove canned foods from the original container.

IV. Points in Storeroom Management

1. Open only one box of a given commodity at a time.
2. Have a definite location on a shelf for each commodity.
3. Have a definite location for unopened boxes of commodities.
4. Place the most recently added commodities at the rear of previously distributed commodities so as to use up the older materials first.
5. Place the lighter materials high and the heavier low, saving energy.
6. Place the most-used commodities in the most accessible places and the less often used commodities in less available places.
7. Arrange shelf commodities so they can be counted easily for inventory purposes.

Service Sheet for Kitchen Management

Another service sheet in this Trenton manual is concerned with the details of kitchen management. All the service problems relating to the care of refrigerator and ice chest, the handling of refuse and the use and care of gas stoves, cleaning, sweeping and dusting are outlined at length:

I. Care of Refrigerator and Ice Chests

1. Wipe shelves daily.
2. Use left-overs as soon as possible.
3. Remove all spoiled foods.
4. Put foods of the same kind together.
5. Cool foods before putting in refrigerator.
6. If foods with strong odors are placed in the refrigerator, place them in air-tight containers.
7. Have doors open only for length of time necessary to put in or take out foods.
8. Keep refrigerator filled with ice. Food is more expensive than ice.
9. Foods requiring greatest cold should be kept on the bottom because the warm air rises.
10. Do not place *meat* next the ice. Put it on a dish *near* the ice.
11. Lettuce, celery and other raw vegetables and fruits may be placed in a damp cloth and placed on the ice.
12. Once a week (oftener if necessary) wash and scald interior with a sal soda solution.

II. Care of Garbage

1. Do not put liquids into garbage with refuse. If a greasy liquid is left over, add a teaspoon of washing soda to it and let it stand a while. This will produce a soapy liquid which can be poured down the drain.
2. Keep garbage can covered.
3. Strain coffee and tea in sink strainer, letting liquids run down drain. Dispose of grounds in garbage pail.
4. Keep can fresh by frequent scrubbing and scouring. Set in sun to air often.
5. Put a piece of paper in the bottom of can, letting it come up around the sides, so that the contents may come out easily.

III. Use and Care of Gas Stove

1. On lighting top burners, open valve and let gas run for a second and then apply match to the burner. If it "burns back" with a roaring noise, turn out and repeat process.
2. In lighting gas in ovens with two doors, open both before applying a match, since gas may collect under the oven.
3. Gas should always burn with a blue flame. If yellow shows, adjust the air regulator.
4. Use full flame only for bringing water to boiling point or for first heating of the oven. Then use a lower flame in order to save gas.
5. The oven should be lit 5 to 10 minutes before use, depending upon heat of flame.
6. Avoid having kettles too full or flame too high, both of which tend to cause boiling over of contents.
7. Broiling in gas oven is done with the door partly open so as to let in oxygen. This is done also for browning roasts, etc.
8. Boil gas burners occasionally in a solution made by dissolving two tablespoons of washing soda in two gallons of water.
9. Wash the stove with kerosene or with a cloth slightly greased to remove rust.
10. Rub stove daily with paper.
11. Keep ovens clean by scraping and scouring.

IV. Cleaning, Sweeping and Dusting

1. Put away or cover all foods before sweeping.
2. Sweep with a bristle brush or broom, with short strokes kept close to the floor, pushing the broom ahead rather than using a pulling stroke.
3. If hot grease falls on the floor, cold water thrown on it will harden the grease and much of it can be scraped up; else cover the spot with starch or borax to absorb the grease and wash later with hot soapy water.
4. Brush up food or wipe up at once anything spilled on the floor, avoiding tracking.
5. In scrubbing, use water sparingly but change water frequently.
6. After scrubbing, wash and rinse all brushes and cloths.
7. Wash daily all work surfaces, paying close attention to corners.
8. Clean brass work daily.
9. Faucets, chains and metal basin stoppers require daily scouring.
10. Dust with a slightly dampened piece of cheesecloth, and change to another when grimy.
11. Wash windows frequently, inside and out, first with hot ammonia or kerosene water and then with clean, hot water. Rub dry with clean lintless cloth. Avoid washing windows when sun shines on them. If windows are grimy outside, use whiting or some similar abrasive which will not scratch the glass.
12. Wash and scrub the sink with hot soapy water, using a cloth which is easily kept clean.
13. Ironwork not used frequently may be preserved from rusting by covering with oil or lard.
14. Pots and pans are best kept clean by daily scouring. If not attended to constantly, a boiling soda cleansing must be a final resort.
15. Washing dishes, silver and china serves a double purpose of cleansing and disinfecting. Therefore, use hot water.

Douglass Hall, a New Dormitory for Men at the College of Wooster

BY D. EVERETT WAID

ARCHITECT, NEW YORK

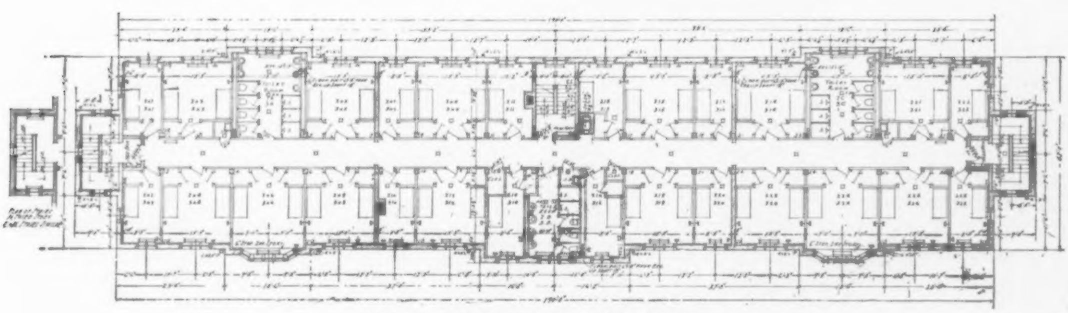
THE beginning of the present school year marked the completion and occupancy of a new dormitory for men in the College of Wooster, Wooster, Ohio. The building known as Douglass Hall, as honoring its donor, the late Elisha Peairs Douglass, has accommodation for seventy-six students, two in a room, twenty-five students, each in single rooms, and a matron in a suite of two rooms with bath accommodations, 102 beds in all.

The structure, faced with light-buff Kitanning brick and limestone trimmings, is of the Collegiate Gothic type and designed to harmonize with other buildings of the campus grouping. In plan it is about 190 feet long and 42 feet wide, and has a gross content of some 436,300 cubic feet (according to the A. I. A. standard method of computation). Its cost, with its complete equipment, was well within the donor's gift of $250,000.

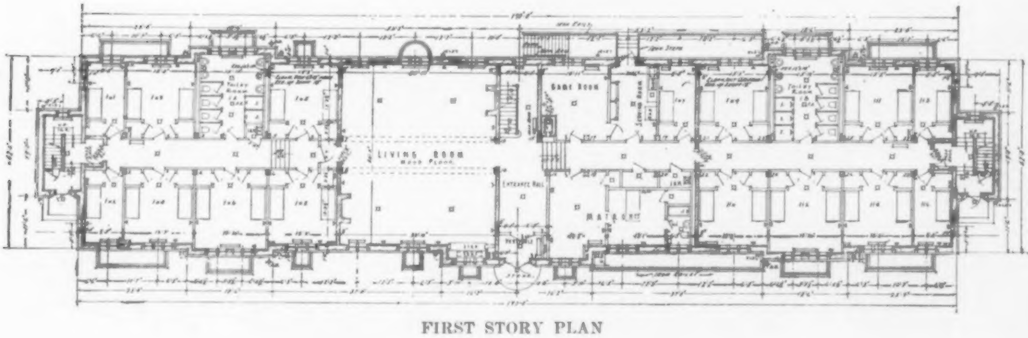
The high basement, planned for future dining-room and kitchen accommodations not at present needed, is unfinished. A large common living-room or lounge is located in the first story next to the central entrance hall and close to the suite of the supervisory matron.

From the accompanying plan illustrations of the first and second stories, the dormitory arrangement will be seen as grouped into three sections (each having its own toilet facilities and stairway exits), not by fixed divisions as in the Oxford manner, but by cut-offs in the long corridors, for which doors would be provided, under lock and key excepting when opened for housekeeping convenience. The building is now in use without these corridor division doors, awaiting developments as to whether the long corridor lengths are

DOUGLASS HALL, COLLEGE OF WOOSTER



SECOND AND THIRD STORY PLAN



FIRST STORY PLAN

misused by the students as bowling-alleys, etc.; this will, at the end of the first year's occupancy, determine the necessity for the installation of doors, or otherwise.

The attic story, formed by a high, steep-pitched roof, is to be used for social functions, dances, etc., on occasion. It is finished very simply, the rafters and collar beams being left exposed above a plain board wainscot.

The building is of fireproof construction, including the attic floor. The rafters are of wood covered with variegated red clay burned tile. It would be possible for the roof construction to burn without hazard to the students asleep in their rooms.

As decorative features, the floor of the main entrance hall is surfaced in random variegated slate, the walls lined with 2-inch random coursed limestone, and the ceiling paneled with oak ribs. The living-room and lounge are floored in quartered oak, the walls are paneled the full height and have two fireplaces and mantel treatment, and the ceiling is paneled with false beam work, all of which is in oak and of Elizabethan general tone. All other floors, except in the basement and toilet rooms, are treated in terazzo, the toilet room being surfaced with green slate and the basement with cement.

The windows of the building are of the steel casement type and are equipped with copper-wire fly screens in aluminum frames. The exterior doors are equipped with panic bolts, and all interior doors are set in integral metal frames and casings. The bedrooms are simply finished with plastered walls and ceilings. Interior doors (other than the exit fire-doors) are of veneered oak.

The standard furnishing of the students' bedrooms consists of

one built-in closet
one low metal bed
one dresser
one study table
one chair

for each occupant, with such other equipment as may be individually added.

PRINCIPAL TYPES OF EQUIPMENT INSTALLED

Doors—Metal Door and Trim Co.
Plumbing Fixtures—Crane Co.
Roofing—Ludowici-Celadon Co.
Showers—Speakman Co.
Stonework—Indiana Limestone Co.
Valves—Sloan Valve Co.
Windows and Sash—International Casement Co.

New Dormitory at University of Oregon Pays for Itself

BY KARL W. ONTHANK

EXECUTIVE SECRETARY, UNIVERSITY OF OREGON

COLLEGE and university dormitories are commonly erected from funds received as gifts or bequests, or, at public institutions, as appropriations from public funds. Occasionally, endowment funds have been invested in dormitories, but the returns, at least from the standpoint of financial profit, have frequently been unsatisfactory. Recently, however, at a few institutions in the Middle West and on the Pacific Coast, dormitories have been put on a definitely paying basis, and in some cases new construction has been financed successfully from dormitory earnings.

The University of Oregon, like most other higher educational institutions after the war, felt the pressure of increasing numbers on a stationary income. In 1920, an additional small dormitory for women was constructed, but thereafter the increasing student body had to accommodate itself as best it could in student living organizations and about town. In many cases the rooming houses were charging high prices for what often was unsuitable service. After considerable study of the local situation, and of experiments by certain other institutions in dormitory building partly or wholly from the proceeds of dormitory earnings, possibilities in this direction seemed sufficient to justify attempting to secure the necessary legislation.

Legislative Authority Given to Issue Bonds

The 1927 Oregon Legislature passed a bill which was unfortunately somewhat hurriedly drawn, but which has served the purpose. This statute authorizes the governing boards of the State College and State University to erect "buildings for dormitory, housing and boarding purposes and for student activities," to borrow money for the cost of such buildings, and to pledge the net income from rentals toward the principal and interest of borrowed funds, "provided that the state of Oregon shall incur no liability by reason of exercise of the authority hereby granted . . . other than is specifically set forth."

When the actual sale of bonds was up, certain questions as to the constitutionality of the act were raised, particularly in reference to the right of the institution to pledge the credit of the state. A friendly suit was instituted and a ruling of the Supreme Court secured. This approved the constitutionality of the act, declaring that bonds issued under it would be state obligations, but that

bond-holders would have no claim against the state except in so far as the act specifically provided, namely, against the net income from rentals or receipts from the building constructed under the authority of the act. Nevertheless, it was obvious that the good faith of the state and particularly of the institutions would be behind any bonds so issued, in addition to the more tangible security of prospective income. Furthermore, on the strength of the law as interpreted by this court decision, exemption from Federal income tax was obtained. This fact aided materially in the sale of the bonds at a satisfactory price.

Profits in Dining-Room and Dormitory Operation

Having this legislation, the problem became one of working out a detailed program for dormitory operation that would, over a period of years safely below that of the useful life of the proposed new building, pay operating expenses and original construction charges. For a number of years the existing dormitories had been operated on a basis which made it possible not only to pay their entire operating expenses, but also to pay the cost of equipping the women's dormitory in 1920, to purchase and remodel a large dwelling in the neighborhood which has been operated as an annex to the girls' dormitories, and to accumulate a cash fund of $2,500. This had been set aside as the beginning of a fund for the erection of a new dormitory for men.

A tentative scheme for financing the remainder of the cost of the building was worked out substantially as follows:

It was proposed to operate the dormitories, as to both dining-rooms and dormitories, on the profits of operating the dining-rooms, leaving the entire rental income of the men's dormitories and one-half the rental income of the women's dormitories free to be pledged against a loan for new construction. An estimate of the rental income on the above basis with a 15 per cent allowance for vacancies, gave a total income available of $46,000. The estimate of the annual charge for the annual retirement and interest over a 20-year period was approximately $30,000, leaving a margin of safety for contingencies of over 50 per cent.

This program, set forth in detail, was submitted to a number of bond houses. After some revisions in the proposals had been made following the suggestions of the bond houses, bids for bonds for the building were called for. The strong bond market in March, 1928, when they were offered, and the tax-free feature, stimulated competition between bond buyers. The actual sale was made on a bid of 92.13 at 4½ per cent interest. Serial retirement was provided for, beginning with the second year, retirement dates being so arranged that the charge of principal and interest together

MEN'S DORMITORY, UNIVERSITY OF OREGON

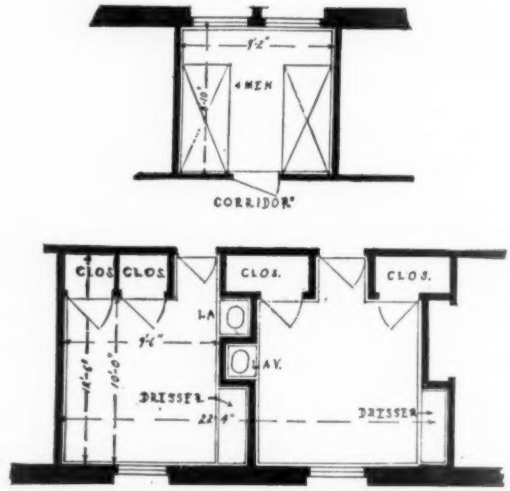
amounts to approximately $30,000 each year. Bonds totaling in face value $365,000 were actually sold. They were disposed of by the dealers almost immediately and are now reported to be difficult to buy.

Meanwhile, the architects had produced plans described below, under which 276 students could be housed at a remarkably low cost per student. These plans had been drawn while the details of arrangement for the bond issue were worked out, including the court procedure, and bids for construction were called for and the contract let on the same day that the bonds were sold. This was in April, but the building was completed, furnished and ready for occupancy the last week of September, when the fall term opened.

The financial report at the end of the first year's operation showed a total income of $40,574, against the original estimate referred to above of $46,000, approximately $5,000 less than the estimate, but still $10,000 above the amount needed for bond service. The reasons for the failure to reach the estimate are referred to below. Measures taken during the present college year to keep the dormitories full are proving efficacious and there is every reason to believe that the income of the present year will reach, if not exceed, the estimate. The margin above the amount required for bond service—which, if the income reaches the estimate regularly, will total a considerable sum in the course of a few years—will be used either for the retirement of bonds or for the construction of additional dormitory units as they are needed. The operating income of the dining-rooms, although suffering somewhat for the same reasons that affected the rental income, was nevertheless sufficient to cover the entire cost of operating and maintaining both dining-rooms and dormitories.

The Problem of Keeping the Dormitories Full

The problem of keeping the dormitories full through the whole year is commonly one of the principal obstacles to satisfactory dormitory management. Before undertaking this project, a very careful survey was made of the exact number of students not living in student organizations, in existing dormitories or at home in the neighborhood, and the capacity of the new building was set at a figure which appeared to be safely below a reasonable estimate of the number of students who could be expected to live in the new dormitory. A rule was promulgated which had been desired for some time, but which for lack of dormitory facilities had not been made, namely, that all freshmen and sophomore men not housed in student organizations or at home in Eugene should live in a dormitory. The dean of men was authorized to make exceptions in genuinely appropriate cases. This rule was already in operation as to the women. As soon as it was decided to construct the building, householders in the community whose business would be affected by it were at once notified. The list of approved houses was somewhat reduced by the elimination of the



UNIVERSITY OF OREGON
MENS DORMITORY
FOUR MEN UNIT
LAWRENCE, HOLFORD, ALLYN & BEAN
ARCHITECTS

less desirable, and the opening of additional rooming-houses was actively discouraged. There was some loss among the householders during the first year, and consequent dissatisfaction, but in the main the situation in this respect was steady, and now in the second year is again normal.

The failure to keep the dormitories filled in accordance with the estimates was due mainly to two factors: first, a smaller increase of enrolment than had been usual for a number of years; and, second, to the impression that developed among the fraternities and sororities that the new dormitory would shortly, for one reason or another, increase the difficulties of keeping their houses filled, with the result that an extraordinarily active rushing season filled the houses above normal capacity, and so reduced the usual number of freshmen and sophomores eligible for the dormitory. Toward the end of the year conferences were held between the University committee in charge of housing and the living organizations, and a program was worked out which insures the houses reasonable protection and at the same time protects the dormitories. This plan is now operating, and as noted above, the dormitories have been during the present year filled nearly to capacity.

Room rental in the dormitories had been $24 a quarter. The regular rate was raised to $30 a quarter, which was still somewhat below the rate prevailing in student living organizations and in private dwellings for comparable accommodations. The rate for the new building was set at $36 a term, the higher rate being justified by the distinctly superior service given. A number of the less desirable rooms in the older dormitory were, however, left at the original rate. The rate for board was left at the previous level, namely, a dollar a day, paid by the month. Considerable econ-

omies were made in dining-room management, however, through concentrating the bulk of the preparation of food and table service in the single kitchen and dining-rooms attached to the new dormitory.

Design and Equipment of Building

Plans for a dormitory along lines most satisfactory as to economy in construction and management and suitability for student use were produced by Lawrence and Holford, the architects for the University of Oregon. These plans provided for a building of six units of capacity varying from 40 to 60 men. Viewed from the exterior, the units constitute a single building. They are entirely separated, however, so far as communication is concerned, except along the interior arcade. The study rooms are arranged for two students, the sleeping-rooms for four, each of the latter containing two double-decked beds. The study rooms are small, being designed around the simple but substantial and comfortable study and dressing-room furniture which they contain. Each unit has its own excellently furnished living-room on the lower floor, separate telephone and guest room, with separate front entrance and distinctive name. Each is organized as a separate self-governing social group. A typical four-man unit is shown in the accompanying drawing. Each room is provided with lavatory. There is a bath on each floor of each unit.

The building is of concrete construction with brick exterior, except that wood is used in the roof. Heavy asbestos roofing is used, however, and the building is thus practically of fireproof construction, and virtually Class A fire insurance rates have been secured.

The furnishings used have deliberately been set at a level distinctly above that of most college dormitories. It was believed that if substantial and attractive furniture were used, the students would respond by taking pride in their surroundings, taking better care of the building than has often been the experience, a consideration of economic importance aside from the educational desirability of providing college students with esthetically and socially satisfactory surroundings. So far, our expectations have been realized, and in the main excellent care has been taken of the building and its furniture and equipment. Incidentally, it is believed that the longer life of furniture and hangings of good quality will prove to be a genuine economy over more flimsy materials.

Dining-Rooms and Kitchen

The building is constructed along one full side of a city block with wings running back at either end to the alley. Ultimately it is planned to duplicate this structure on the oposite half of the block, completing the square. The kitchen is placed on the alley in the center of the area, and the dining-halls between it and the dormitory structure proper. Kitchen and dining-rooms are one story in height, the main dining-room, however, having a high beamed ceiling. The dining-rooms are so arranged that each unit may have a separate room, but the whole space may be thrown into a single room for large banquets. This was designed to hold 500 as a total, but as many as 800 have been served without serious inconvenience.

The kitchen is designed for service of 1,000. When the other half of the ultimate structure is added, the kitchen is expected to provide for the entire group with no additions except equipment. It is equipped with all the modern labor-saving devices for food preparation and service in large quantities, and with adequate cold rooms and other facilities for receiving and storing quantity purchases. Food is prepared here for all the university dining-rooms. These include the rooms attached to this structure, and also the dining-hall for girls, the student infirmary and the Faculty Club. Banquets for as many as 1,000 people have been prepared and served from it also, in addition to its regular service to students.

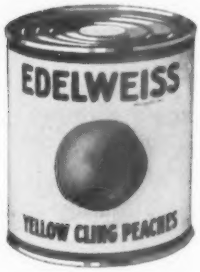
Costs, Total and Per Student, of Completed Building

The total cost of the completed building was approximately $330,000. The cost of the kitchen and dining-room portions of the structure was at least $50,000. The number of students housed is, exclusive of guest rooms, 276. The cost per student for the entire structure is therefore approximately $1,200, and of the dormitory units alone just over $1,000. So far as the writer has information, this is the lowest cost per student for virtually fireproof construction that has been as yet announced. Fireproof dormitories rarely cost less than $2,000 per student, without dining-hall facilities; $5,000 per student is probably more nearly standard. The cost of not a few well-known student houses has run very much higher. Even frame-interior structures built in this region have commonly cost at least $1,200 per student and have often run higher. Our low cost was accomplished, as has been noted, mainly by reducing materially the cubic space allowed per student through substantially the same methods utilized in modern hotel and apartment house construction, but without cutting down on conveniences. Equipment and furnishings for dormitory and dining-halls and kitchen cost $40,000.

JOHN SEXTON & COMPANY

Illinois, Orleans and Kingsbury Streets
Chicago

All of Sexton's Canned Fruits are equally delicious. All are allowed to completely ripen in the sun before being picked. Each fruit is obtained from the locality where it grows best—and then only the choice of the crop is taken. Packed in No. 10 tins, the container most economical for school cafeteria use.



If you went into the finest garden and selected the vegetables to serve your pupils you could find no better than those which come to you packed under the Edelweiss label. Each vegetable distributed by Sexton is selected where soil and climate are best suited to its perfect production. Picked at just the right time, and packed on the spot, they reach you retaining all the vitamin value, full flavor and succulence of the fresh vegetable.

Delicious preserves, jellies, marmalades and fruit butters, made in Sexton's Sunshine Kitchens, are of excellent quality because the materials from which they are made — selected fruits and cane sugar — are the finest obtainable. They are made with great care, in small quantities, giving them the beautiful color and the delicious appeal of home made preserves. In our Sunshine Kitchens we also prepare a complete assortment of pickles, relishes and condiments of quality. Edelweiss mayonnaise dressing, catsup, mustard and chilli sauce are packed in handy gallon glass bottles.

Among other Edelweiss Foods particularly popular with school cafeterias are: Coffee, individual tea, cocoa, gelatine dessert, chocolate pudding, peanut butter, macaroni, spaghetti, canned fish, paper napkins and paper specialties, Edelweiss No. 10 can soups, dried fruits and tapioca.

If one of our representatives has not called on you please write us.

COFFEE IMPORTERS — BLENDERS AND ROASTERS

SINGER SEWING MACHINE CO., INC.

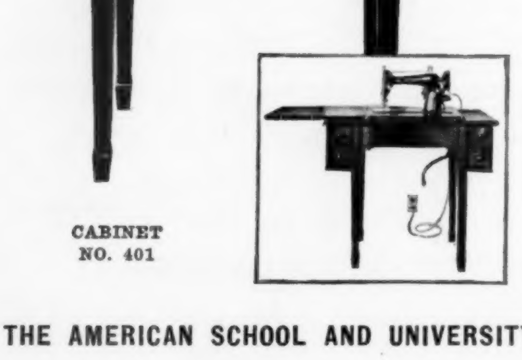
Singer Building, New York City

Shops and Service in Every City in the World

Today the schoolroom is the training ground not only for successful business careers but for happy and efficient living. Educators know that most homes are now electrified. Also, that an electric machine can do three times the work done on a treadle machine in a given length of time and with less effort. That is why leading schools are equipping classrooms with the Singer "Student" Model—the modern electric sewing machine especially designed for classroom use.

Classroom Features of the "STUDENT" *Model*

1. **Singerlight**—providing individual light, without glare or shadow, for each student.
2. **Adjustable Knee Control,** making possible a comfortable position for a child of any age.
3. **Safety Lock** on cover, insuring mechanism against vandalism or accident.



CABINET
NO. 401

4. **Open Compartment** for storage of students' books, materials, etc., or, if preferred, the machine may be equipped with two drawers on each side.
5. Cover, when opened, provides **extra length** for supporting large or bulky materials.
6. When closed, it forms a **flat-topped,** smooth table of convenient height, which may be used as a desk.
7. Choice of Rotary or Oscillating Sewing Mechanisms; **quiet, light running and free from vibration.**
8. **Large capacity round bobbin,** located horizontally under the slide, within plain sight and easy reach.
9. **Automatic Bobbin Ejector**—a touch of the finger raises the bobbin to a position where it may be instantly removed.
10. **The Singer Automatic Bobbin Winder,** with automatic release which prevents winding the bobbin too full.
11. **Upper and lower tensions easily regulated,** making possible a beautiful and elastic lock stitch on lightest or heaviest textures.
12. **Automatic Tension Release**—preventing puckered seams or broken threads and saving time and effort.
13. **Concealed Needle Bar**—eliminating the distraction of motion before the eyes.
14. **Thread Cutter,** located just above the presser foot, makes possible withdrawal of material and cutting of threads with one motion.
15. **Choice of built-in or attached motor,** each entirely safe, fully enclosed and dust-proof, with simplified wiring system and three-pin terminal approved by the National Board of Fire Underwriters.
16. **Special legs** of any desired height, bringing the sewing surface to proper level for pupils of any size.

CABINET
NO. 402

SINGER EDUCATIONAL SERVICE

FREE to Schools and Colleges

The Singer Educational Service is provided solely to facilitate the teaching of machine sewing and to make possible in the home, through the medium of our schools and colleges, more extensive and profitable use of the modern sewing machine. The service is furnished without cost or obligation of any kind to the school using it. The service consists of the following:

An intensive course, for sewing teachers, of practical machine operation and adjustment, varying from one to ten periods of one hour to one day each, according to local needs and conditions.

Free textbooks for teachers taking the course.

Free loan of machines to teachers for practice work if machines are not available.

Free materials, to be used by teachers in practice work.

Free manuals on machine sewing for pupils of sewing classes.

Free wall charts, illustrating threading of machine and bobbin.

A demonstration lesson for sewing classes when the intensive teachers' course has been completed.

Why SINGER SEWING MACHINES are Preferred by Schools and Colleges

1. Most homes are equipped with a Singer.
2. They are built to stand the abuse of "beginners."
3. The Singer Company offers a free educational service to schools and colleges.
4. Singer Service is universal and dependable. **In every city in the world** there is a Singer Shop equipped to effect satisfactory repairs and adjustments promptly, to supply needles, oils, belts, and to maintain the machines in good running order. **Such a service is not available from any other source.**
5. A periodical inspection and adjustment service is rendered to schools, and emergency repairs promptly made, all without charge. Special discounts on parts and supplies.
6. Attractive discounts are given on all Singer models for school use.

WESTINGHOUSE ELECTRIC AND MFG. CO.

EAST PITTSBURGH, PENNA.

Offices in all principal cities throughout the United States

COMMERCIAL COOKING EQUIPMENT

BAKING AND MEAT ROASTING OVENS

Westinghouse sectional bake ovens have many features, the value of which can be readily recognized. The ovens are of the hearth type and are built in sections.

BAKE OVEN, 2-SECTION CAPACITY

In operation, each deck is independent of the other decks and has separate, automatic heat control. Thus, products requiring different baking temperatures may be baked in adjacent ovens at the same time.

Each section consists of top and bottom heaters, control switches and tile hearth. A complete oven has either one, two or three sections, a bottom panel and a stand of suitable height.

Sections are made in four sizes, with capacities 10, 20, 40 and 60 one-pound loaves of bread. Special sizes include 90, 120 and 200 loaf sections.

MEAT ROASTING OVEN, 2-SECTION CAPACITY

Westinghouse sectional meat roasting ovens are made in capacities to meet all requirements from the small restaurant or tea room to the largest hotels or cafeterias. Construction identical with the bake ovens makes possible a combination of baking and roasting ovens serving a very definite need.

These roasting ovens will pay for themselves in a comparatively short length of time, due to the reduced shrinkage of meats in this type as against the fuel types. Three sizes of ovens are available, each of one- or two-section capacity, sections being furnished in 60, 125 and 250-pound sizes.

COMBINATION OVENS

Meat roasting and baking sections are interchangeable. Thus any oven can be made into a combination with one or more meat roasting sections as desired.

HOTEL TYPE RANGES

The Westinghouse three-foot and four-foot section Hotel Type Ranges are built to meet economically all demands for heavy service operation in cafeterias and institution kitchens. The ranges are made entirely of heavy steel with all joints welded, and are built to give lasting service over an indefinite period.

HOTEL TYPE RANGE 3-FOOT SECTION

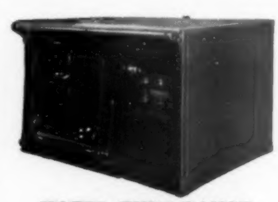
The three-foot section range is suitable for duty in small kitchens where the four-foot section is not required. Small institutions find this range very adaptable where compact design and durable construction are desired.

The roasting oven in both ranges is equipped with top and bottom heaters adaptable for either roasting or broiling. Ovens can be supplied with either automatic or non-automatic control.

The cooking surface of the four-foot section consists of four cooking plates; the three-foot section two cooking plates, surrounded in each case by a belt of brushed steel trim. These plates are supported by angles and are recessed so that the top is a smooth surface.

All heating units are controlled by three-heat reciprocating snap switches separately fused, giving maximum flexibility of heat control and permitting different operations at one time.

In order to do direct surface cooking alone, a Westinghouse four-foot section cooking top is provided. The top is identical to that of the range with exception that instead of the oven, a space, divided into two equal sections with a shelf, is provided below the cooking surface for storing pans, etc. A standard black-japanned sheet steel plate shelf can be furnished with all ranges and cooking tops.



HOTEL TYPE RANGE 4-FOOT SECTION

Listed in the Westinghouse Commercial Cooking Catalog 280.

HOTEL TYPE BROILER


HOTEL TYPE BROILER

The Westinghouse Electric Broiler is designed to insure convenience of operation, low operating costs and long life. The frame work of the broiler is of structural steel, well braced with welded joints, making a very rigid construction. Body is heavy grade sheet steel black-japanned with polished steel trim.

Broiler is made in two sizes, the large broiler being supplied with a roasting oven.

COFFEE URNS AND STANDS

The Westinghouse electric urn is a combination coffee and hot water urn consisting of two compartments, one for hot water and one for coffee. This urn repours the coffee automatically with the cover closed, retaining the aroma and flavor. Coffee cannot be made until the water boils and this boiling water is then sprayed over the ground coffee. Only the required amount will syphon over the coffee, thus preventing over-flowing and waste.


COFFEE URN WITH STAND

The urn body is made of very heavy copper, nickel-plated and polished. The coffee container is made of heat-resisting glass in the smaller sizes and rust-proof metal in the eight and ten-gallon sizes.

The Westinghouse Urn stands combine an electrically heated cup warming space with a solid base for the urn itself. The frame is constructed of angle iron, rigidly braced, while the body is of aluminum-coated steel and all trim of Monel metal.

ELECTRIC GRIDDLES

Westinghouse electric griddles are suitable for both continuous and intermittent operation in cafeterias and institution kitchens. The griddles are made in two sizes with bodies of heavy sheet steel. The feet are cast-iron; the legs and switch box are black-japanned and the body is polished nickel plate. Griddles have cast iron tops with heavy grease grooves around the outside edges.

The 20" griddle has one heater, while the 38" has two, each covering one-half of the top area. Each heater is controlled by a three-heat reciprocating snap switch.


ELECTRIC GRIDDLE

ELECTRIC HOT PLATES


ELECTRIC HOT PLATE

The Westinghouse hot-plate is in reality a small electric stove suitable wherever high temperature cooking units are needed. The two 1800-watt heating units are of the enclosed type, 8" in diameter, each controlled by a three-heat snap switch.

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Listed in Commercial Cooking Catalog 280.

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MICARTA TRAY

Also because alchol, moisture, most, acids and alkalis have no effect on Micarta trays, they are used in laboratory work where ordinary trays prove unsatisfactory.

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Listed in Electric Range Catalog 281.

For Commercial Lighting Pages, see 138, 139.


DOMESTIC RANGE TYPE C-83

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Gas-Heated Steam-Jacketed Kettles

Especially adaptable for Schools, Restaurants, Tea Rooms or Institutions. It is ideal for use where cooking must be done for a large number of persons, but where steam is not available the year 'round. Will do everything expected of a regular Steam-Jacketed Kettle operated on a steam line.

About 60 minutes are required to bring water to the boiling point and create steam in a 60-gallon gas-heated, steam-jacketed kettle.

Method of Operation

A large, horseshoe-shaped gas burner is fitted directly beneath the center of the kettle. Through the water inlet pipe sufficient water is admitted to partially fill the space between the shells of the kettle; the inlet is then closed. Heat from the gas burner is applied until the water is converted into steam. The steam does not circulate but remains between the two shells, thoroughly heating the kettle and its contents.

The kettle is fitted with the usual tank outlet and draw-off, although it can be supplied with solid bottom if desired. There is also supplied a safety valve, steam pressure gauge and water gauge.

The "Wear-Ever" Gas-Heated, Steam-Jacketed Kettle is made in ten sizes as given in the following table showing dimensions in inches on each size:

Number Gallons, Capacity	Height from Floor to Top of Kettle	Diameter Kettle, Inside	Depth Kettle, Inside
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15	$43\frac{5}{32}$	$21\frac{5}{8}$	$15\frac{5}{32}$
20	$45\frac{29}{32}$	$22\frac{3}{8}$	$17\frac{21}{32}$
25	$45\frac{29}{32}$	$22\frac{3}{8}$	$17\frac{21}{32}$
30	$48\frac{7}{8}$	$25\frac{3}{8}$	$20\frac{3}{8}$
40	$50\frac{1}{8}$	$27\frac{5}{16}$	$21\frac{5}{8}$
50	$52\frac{3}{4}$	$29\frac{5}{8}$	$24\frac{1}{4}$
60	$53\frac{1}{2}$	$32\frac{1}{2}$	$24\frac{3}{4}$
75	55	$35\frac{5}{8}$	$26\frac{1}{4}$
100	$54\frac{9}{16}$	$42\frac{11}{16}$	$25\frac{9}{16}$

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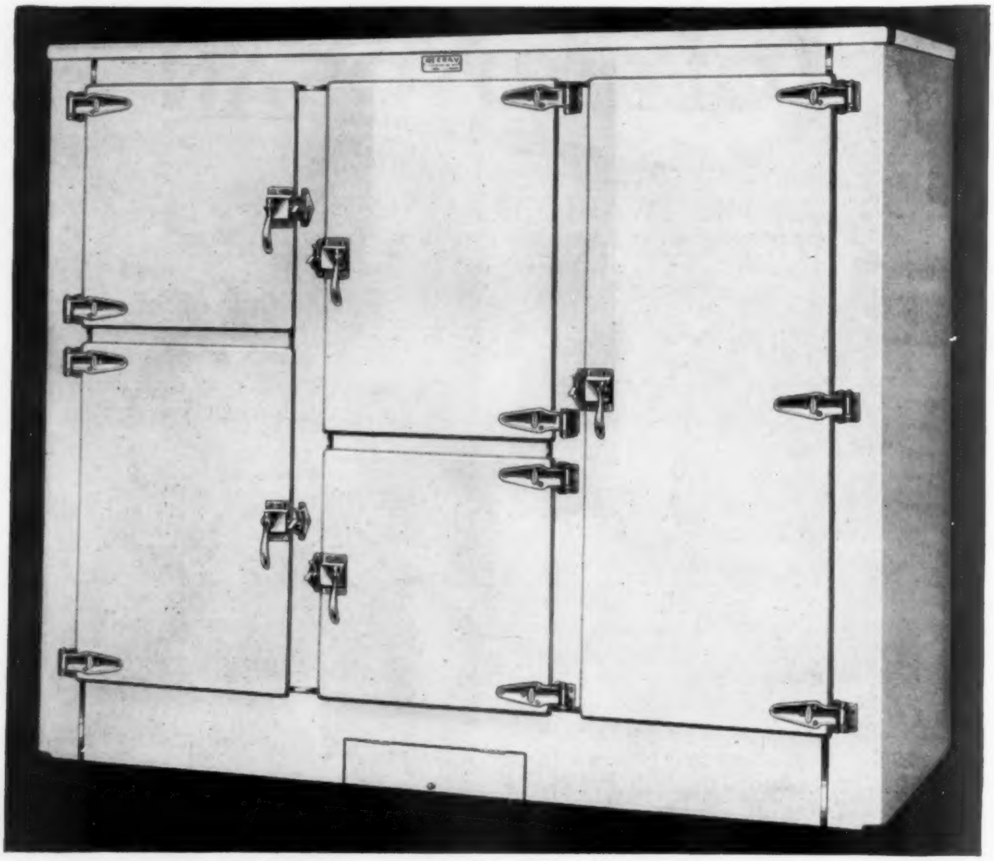

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The walls are 5 inches thick, heavily insulated with 4 inches of pure corkboard, sealed with hydrolene. Staunch construction throughout, in every hidden detail, insures efficient, economical and enduring service.

McCray refrigerators are built for use with mechanical refrigeration of any type, or ice. No change is required; the cooling units can be installed immediately. McCray builds refrigerators, coolers, chests of many sizes and styles to meet every need in the school or college kitchens, as well as in the laboratories and infirmaries.

See the McCray models at the salesroom nearest you, or write direct to the factory for catalogs and complete information. No obligation, of course.

INDUSTRIAL EDUCATION

Ten Points to Be Considered in Planning Shop Layouts and Equipment

BY M. M. PROFFITT

SPECIALIST IN INDUSTRIAL EDUCATION, U. S. OFFICE OF EDUCATION, WASHINGTON, D. C.

I.

That shop layouts and equipment be definitely planned in accordance with the shop work to be carried on, and that they be of a character and type best adapted to the realization of the specific objectives of the course.

This proposition assumes that the specific objectives of the shop course have been determined before shop plans and lists of equipment are attempted. If this is not done, one cannot proceed intelligently in planning housing facilities and equipment for carrying on the work. A corollary of this proposition is also true, namely, that once the specific objectives for a course have been determined, shop layouts and lists of equipment should be made to conform definitely with them. One of the unfortunate conditions quite commonly found in connection with shop work is the consequence of the failure to make these two propositions a controlling influence in providing the physical plant for the shop course.

For example, a school system decides that it wants to offer "some shop work," and in drawing the plans for a new building the architect provides "some room for shops." The result is that when shop courses of a specific character are undertaken, it frequently happens that the physical arrangements are neither proper nor adequate for the work. Again, a school system decides that it is necessary to offer a course in automobile mechanics, perhaps some other lines of trade work also. Instead of planning and providing a proper physical plant, a new grade or high school building is erected and the old school building is abandoned to the shop courses, or perhaps becomes the new vocational or opportunity school of the city. If the school is not so fortunate as to be assigned a separate school building for shop work, space may be made in the basement of a school building, or an old store or dwelling-house may be used.

The same danger exists with reference to equipment. Specific types of courses require specific equipment, and much of the old equipment found in general types of shops, or equipment which has been used for war purposes and which now comes as a gift from the Federal Government, is not adequate for the specific type of work to be carried on. It is absolutely impossible under such conditions to realize in full measure the objectives that should be the aims of the shop course.

Specific equipment for specific forms of work should be of proper size and quality. Even a good workman cannot turn out good work efficiently with poor tools. The proper size of tools and equipment is essential, both from the standpoint of economy and from the standpoint of securing high-quality work. For example, an oversized motor may not be run at its normal and efficient rate of speed; an undersized motor may burn out when forced to carry an overload. A cardinal principle governing the selection of equipment for a course which it has been definitely decided to offer is that the specifications for each piece of equipment shall be determined prior to making a decision relative to the amount of money that is to be paid for the particular piece of equipment. This presupposes that an estimated budget for equipment has been agreed upon before it is decided to offer the course.

II.

That for vocational and industrial courses the shop layouts and equipment be representative of those found in industry and that they be adequate for giving an atmosphere something like that found in the commercial shop.

This principle is based upon the assumption that the school shop will do production work. There will be some jobs carried on comparable in size to those carried on in the commercial shop. The working conditions found in the commercial shop should obtain in the school shop, at least to the degree of furnishing the student with some knowledge of what he may expect in the industry, and of causing him to form reactions and habits

similar to those needed for successful work in the commercial shop.

This must not be construed to mean that a school shop should be equipped with nothing but the latest and finest types of machines; it does not mean individual drives for all machines. It does mean, however, that some attention should be given to equipping the shop so that it will represent some of the rather varied conditions under which a boy will be expected to do work when he goes into the commercial shop. Under such conditions, the boy meets with some of the real problems that will confront him when he enters upon a payroll job. This means that in such shop work as plumbing there will be facilities for doing roughing-in work and for tearing out old work.

III.

That control of the elements with regard to layouts and equipment receive careful attention in making plans for shop work.

Shop housing conditions must take into consideration the control of the natural elements, so that they may be of an advantage to the worker rather than a disadvantage.

(a) *Light (artificial and natural illumination).*—The control of illumination for working conditions in a shop is one of the most important problems to be met in making shop plans and locating machines, work-benches, and other equipment. Too much light may be as detrimental as too little. The kinds of glass to be used in the windows, the use of skylights and the location of machinery and work with reference to light, are factors making for efficiency which cannot be neglected in planning shop courses. This is especially true for drafting-rooms, machine shops, and engine rooms.

(b) *Air (including ventilation).*—The amount and circulation of air in any shop are important items in the control of working conditions. Particularly is this true for such shops as the forge shop and the automobile shop, where noxious and possibly poisonous fumes are emitted, especially in the operation of internal-combustion engines. If the natural means for renewing the air in such shops is not sufficient, artificial means must be provided for in the plans of the building.

(c) *Moisture.*—The amount of humidity in the air is another very important condition affecting not only tools and machinery, but frequently the materials in process of manufacture. For example, in prescribing equipment for a baking department, definite consideration must be given to providing the proper humidity in the dough room. For this purpose, certain types of humidifiers are used. Moisture affects many types of raw material as well as material in process of manufacture—flour for the baking department, lumber for the woodworking department, cement for the building construction department; each needs to be housed under proper conditions relative to humidity.

(d) *Temperature.*—Temperature is frequently associated with moisture in problems dealing with the proper care of lumber, especially in storage rooms for lumber. Temperature must be definitely controlled in the proofing process of bread. Humidity and temperature are important factors which necessitate careful regulation in connection with work in printing in colors. An arrangement to control the temperature of the air for workers in foundries and in plumbing shops where joint wiping is carried on, is essential to the health of the worker.

IV.

That in the preparation of plans for shop layouts and equipment, intelligent consideration be given to floor space and the proper location of equipment.

It is necessary not only that floor space be sufficient as to number of square feet included, but also that shape and arrangement be such as will best facilitate the work to be carried on. A square room may be quite proper for one kind of shop work, an oblong room the most desirable and economical for another. Before shop plans are completed, definite consideration should be given to providing proper locations for the principal pieces of equipment, proper and adequate space between pieces of equipment, and adequate foundations and support for equipment, especially for machinery. A common error is the failure to arrange for spacing between machines that will best facilitate the handling of stock and the passing of work from one machine to another in the process of its manufacture. Another frequently seen error is the failure to provide proper foundations and supports for such equipment as large printing presses and heavy machines found in the machine shop. While such pieces are large, the work turned out often necessitates accurate and fine manufacturing processes. Without a proper and stable setting for a machine, not only is it difficult to turn out a fine piece of work, but the machine itself is subject to strains which impair its usefulness and shorten its life.

V.

That provisions be made for adequate tool cages and other stationary and portable equipment auxiliary to instruction, and also for their proper location in the shop.

The importance of providing at the opening of a new shop suitable facilities for caring for tools and at the same time making them easily available for use, is frequently overlooked. As a consequence, very necessary and costly tools are either damaged because of the lack of proper means for taking care of them, or are not easily accessible to the workers. Probably both situations obtain. Such conditions result in the slowing-down of the work and the deterioration of tools and instruments. Tool cages should be so

located as to make the tools readily available to the workers, and so arranged as to facilitate checking them in and out. In planning shop layouts and equipment, consideration should also be given to provisions for taking care of instructional material such as blueprints, instruction sheets, and shop records. Forethought in connection with plans for shop layouts and equipment will save a lot of troubled afterthought in attempt to secure good working conditions in the shop. Consideration given to the arrangement of floor space and the placement of equipment will greatly facilitate the work to be undertaken in a new shop and will make for efficiency in instruction.

VI.

That shop plans provide for proper and adequate facilities for receiving incoming work, stock and supplies.

This item includes provisions for such necessities as proper means for receiving automobiles for repair. Thought must be given to planning a proper type of entrance and the right kind of shop door for the automobile repair shop, and such other arrangements as will facilitate the moving of cars in and out. Forethought given to planning proper space and means for unloading lumber at the carpenter shop will save a great deal of inconvenience and a loss of time in receiving stock for this department. The particular arrangements that should be made will depend upon the plan of the shop—whether there is an outside room, whether the shop is on the first floor, or whether it is adjacent to an alley or to a back driveway. The one who prepares the shop plans for departments receiving large-size raw material should always consult with some one familiar with conditions under which raw material must be unloaded and received. These remarks apply also to such shops as the machine shop receiving large pieces of steel, and to the baking shop which receives flour in considerable quantity. Where shops are located above the ground floor, proper elevator facilities or stairways must be provided in order to prevent loss of time and probably damage to the building due to the handling of the stock.

VII.

That proper and adequate storage facilities for incoming stock and supplies be provided.

Stock must be stored in places where it will not be damaged, and where deterioration due to the elements will not affect it. Lumber must be stored so that it will be kept dry; steel where the conditions are favorable for preventing rust; flour where it will remain dry; fragile supplies where they will not be broken, etc. In addition to plans for preventing deterioration in stored materials, attention must be given to making such materials easily available when they are desired in production work. This means that attention must be given to providing proper racks, proper bins, and other receptacles for stock so that different kinds of stock may be kept separate and thus made easily accessible. Much time is wasted in many school shops because of the failure to store stock so that certain pieces may be easily obtained when wanted.

VIII.

That proper means for the care and storage of stock in process of manufacture be provided.

For example, proper provisions should be made for caring for cabinet work from the time the woodwork is completed until the time the finishing work is started. The failure to provide such facilities is commonly seen in school shops. The result is that cabinet work frequently has to be cleaned or repaired before the finishing work can be started. Woodwork that is to be painted or given any other kind of wood finish should be in first-class condition when it comes to the finishing department. Another problem in connection with work in process of manufacture, arises where day-school classes and night-school classes are operated in the same shop, using the same equipment. A great deal of confusion, embarrassing situations, and unhappiness on the part of both students and instructors arise from not having facilities for properly caring for the unfinished work of the students in these two types of classes. If the uncompleted work of one group must be removed in order to give the other group the use of the equipment, provisions for its proper care should be made.

IX.

That proper storage for completed jobs be provided.

This includes plans for the temporary storage of finished jobs until they are permanently removed from the shop, and for facilities for the display of completed jobs that may remain on exhibition indefinitely in the shop. In the pattern shop as well as the cabinet shop and machine shop, completed jobs are sometimes damaged before they are removed from the shop. This frequently happens in connection with the bringing-in of raw material or the moving of stock in process of manufacture, or by unfavorable working conditions in general. It is as important that jobs be cared for properly until removed from the shop as it is that the jobs be properly done. Damage to completed work is quite expensive because of the amount of labor that has been spent upon it. For display purposes, proper arrangement of the jobs on some kind of display bench or on wall space is necessary, not only to show them to an advantage, but also to prevent damage or deterioration. The pattern shop, the bake shop, the paint shop (including sign painting), and the machine shop, are examples of shops which demand some definite consideration of plans for caring for finished jobs.

X.

That proper disposal of waste products from the shop and arrangements for keeping working conditions in the shop up to standard be provided.

There should be definite plans, before a shop is opened, for the disposal of the waste materials. Whether blower systems shall be installed for the removal of shavings and small scraps from the carpenter shop and the cabinet shop, or whether the scraps shall be gathered together and carted away, should be decided in advance. Consideration must be given to the disposal of scraps of metal in the sheet metal shop. The paint shop needs special facilities for cleaning brushes and disposing of waste products. The machine shop and other shops using considerable waste for cleaning machines should have definite means for its disposal. In the automobile shop there should be plans for temporary storage and disposal of junked parts.

Some shops require special facilities for maintaining proper working conditions. Where such items as the supply of water or the installation of ventilating fans is required, these should be planned for in the preparation of shop layouts in order that they may be of adequate size and properly located so as to be of the most convenient service.

Plan of Classroom and Shop for Agricultural Work in High Schools

BY L. M. ROEHL

ASSISTANT PROFESSOR, DEPARTMENT OF RURAL ENGINEERING, CORNELL UNIVERSITY

IN communities where vocational agriculture and the related shop work are included in the curriculum, it is desirable to have the classroom and shop adjoining with rolling doors between them.

The accompanying plan shows a classroom 22 x 30 feet and the shop 22 x 48 feet. One side of each room is taken up with windows. The other side adjoins the rest of the building, the doors from the classroom and shop leading into a corridor. Rolling doors are preferable to swinging doors, because they require less floor space. When the doors are open, the two rooms may be better used for community fairs and the exhibition of agricultural products.

The numbers on the drawing indicate the location of shop and classroom equipment as herein described.

Cases, Shelves, Tables, Etc.

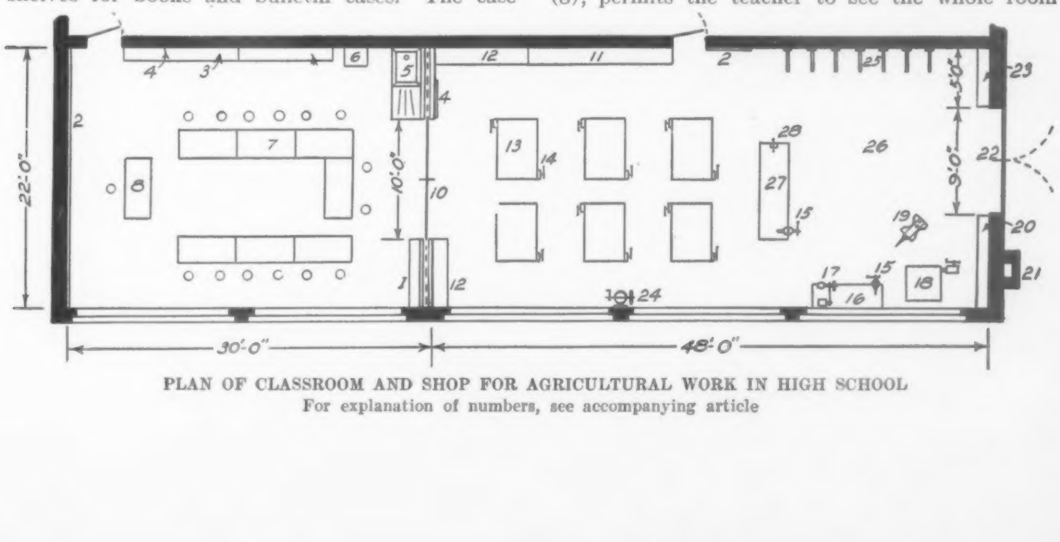
Number 1 shows the location of a case or shelves for books and bulletin cases. The case should have a depth of at least 11 inches and a height of 5 feet 6 inches. The space allows a length of 5 feet 8 inches.

The entire front end of the classroom is given over to a blackboard, indicated by No. 2. It should be noted that another blackboard is placed on the wall of the shop next to the door.

Numbers 3 and 4 show the location of an open case for project records, drawing-boards, current magazines and bulletins that are being used by the classes. The case should be so built that the magazines and bulletins lie flat and the title pages visible.

Number 9 indicates the location of a case for materials. It should be built with doors that are provided with locks.

Seven tables are provided for students, two students to a table. Each table is 2 feet 6 inches high, 2 feet 4 inches wide and 5 feet long and has two drawers, one for each boy. The arrangement of pupil's tables (7) and teacher's desk (8), permits the teacher to see the whole room



PLAN OF CLASSROOM AND SHOP FOR AGRICULTURAL WORK IN HIGH SCHOOL
For explanation of numbers, see accompanying article

and shop. If more than 14 boys are in the class, they may be placed on opposite sides of the tables.

The location for a sink and drain board is indicated by Number 5. It is assumed that other washing facilities are in the building for boys' use following work in the shop.

The Babcock milk tester is located on table 6.

In this arrangement of the equipment in both classroom and shop, boys may move about without interfering with one another.

The seven workbenches are not fastened to the floor. By virtue of their being portable, they may be set aside if it is desired to use the main floor space for farm machinery, or they may be otherwise arranged for exhibits and fairs.

Kinds of Shopwork

The shopwork is to include jobs in the following types of work: repairing of farm machinery and the forge work that is incidental to it; cold metal working; grinding farm tools; soldering; harness repairing; elementary pipe cutting and fitting; single cylinder gas engines and tractors; saw filing; fitting handles; elementary carpentry and woodworking; painting; and general study of electricity and electrical equipment as applied to home and farm.

The shop is planned to have a variety of work being done at the same time, and the shop course should include repair jobs from the farms and homes of the boys in the classes.

The double workbenches (13) are 2 feet 9 inches high, 3 feet 4 inches wide, and 5 feet long. They are equipped with rapid-acting vises (14) one at each side. Ample bench surface is thus provided by using the minimum floor space.

The general bench (27) is 2 feet 9 inches high, 24 inches wide, and 8 feet long. It is equipped with a metal vise (15), and a pipe vise (28).

Overhauling of Farm Machinery

The gradual disappearance of the smith from the field of service to rural people shifts the responsibility of overhauling his own machinery to the individual farmer. This can be better done by the aid of a forge. Some training in the use of a forge is thus in place in a rural high school shop course in the overhauling of farm machinery and the shaping and tempering of pick-axes, mattocks, cold chisels, punches, and other similar tools. Number 18 indicates the location of a forge and 19 the anvil. Smoke from the forge is taken out through a flue (21).

The metal working bench (16) is placed near the forge so that the metal vise (15) is close at hand for one working in the metalworking corner. The vise should be a heavy blacksmith's vise. Special tools and some supplies are kept on shelves or rack (20).

With the rapid extension of electricity to farms, it seems in place to have a motor-driven grinder, and each boy in a class should have experience in grinding axes, mowing machine sickles, ensilage cutter blades, scythes, cold chisels, wood chisels and all other tools used on farms and in the homes of the community. The location of such a grinding rig is on the bench at Number 17.

The location of a hand-driven drill press is shown by Number 24.

Experience has shown that it is better practice to have the tools on racks and shelves at a convenient place in the shop than to have them in drawers of the workbenches. Number 11 shows the location of such a rack or tool board.

A problem constantly confronting the shop teacher is what to do with work which a boy has under way, and also his shop clothes during the time between shop periods. Figure 12 indicates locations of double tiers of lockers for storage purposes.

Number 25 indicates the location of a rack for the storage of lumber and iron. It is desirable to have in storage a few bars of a large variety in sizes of round and rectangular mild steel. This is necessary for repair work on machinery.

It is also desirable to carry in stock a small quantity of each of a large variety in sizes of bolts, rivets, washers, nuts, nails, screws, lock washers, cotter keys, etc. Number 23 indicates the location of a case for the storage of such supplies.

The 9-foot outside door permits passage of farm machinery, tractors, and large portable farm equipment. The open floor space (26) in front of the door near the forge, anvil, vise, grinder and tools presents a situation somewhat similar to a set-up that may be extended to the farms of the community.

Principles and Examples of School-Shop Planning

BY WILLIAM E. WARNER*

OHIO STATE UNIVERSITY, COLUMBUS

I. *Planning for an Educational Program*

LAYMEN, school-board members, architects, school superintendents, and teachers, when approaching the problem of judging or planning a school-shop layout, should first ask themselves, "What is the nature of the program of education that should be seen in such a room, shop, laboratory, or studio?" The answer is not easily stated, for school-shop work is growing increasingly complex with the development of industry and the refinements that naturally develop as more is known about the place or function of such work in the schools.

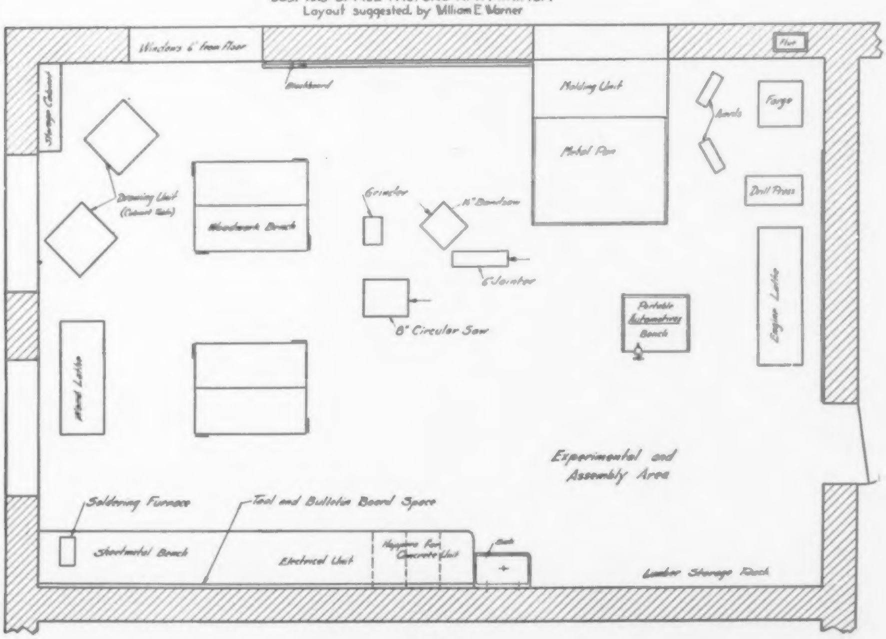
Some type of shop work may justifiably be found on all school levels, as elementary, rural, junior high, senior high, continuation, and teachers college. The present discussion is limited to the junior and senior high school.

* EDITORIAL NOTE.—The writer of this article is an Associate Professor of Practical Arts and Vocational Education at the Ohio State University. He has served professionally as a consultant in problems of school-shop planning in Ohio. His doctorate is in Industrial Arts and Vocational Education at Columbia University in 1928.

Formerly, the visitor to such a school would have seen a "unit woodworking shop" and a "*mechanical* drawing room" almost without exception. Since the World War, there has been a change, a gradual but sure change, in emphasis. What is the reason for this shift? Is a statement possible that will indicate the need for "reconstruction"? (See ref. 9.) What are the purposes of the present-day program of industrial arts on these school levels?

1. The fostering of hobbies or *avocational interests* is important in shop work for boys and even girls 12-18 years of age, on account of their adolescent nature and the character or complexity of our present-day industrial society. Youngsters of these ages are naturally awkward, socially and sex-conscious, inquisitive, and gregarious. They are growing rapidly in physical and mental capacity, are enticed by many outlooks for jobs or careers, are filled with many new emotions, and thrilled with the speed of communication. They are youth in a new age. It is essential for them to have a school or shop

A SMALL GENERAL-SHOP
25'x35' 5-18 Pupils
Adapted to Rural School Basement Rooms
COST AND SPACE FACTORS AT A MINIMUM
Layout suggested by William E. Warner



environment that will permit the development of a broad range of *avocational interests,* for these frequently point to *aptitude traits* and resulting *careers.*

2. Growing directly out of this first purpose is the second, *exploration,* a frequently misused term. Neither exploration nor any of the other objectives in this field can be achieved solely through the manipulation of tools, machines, job sheets, or materials. The shop at best can be only a center about which "exploration" revolves through reading, excursions, play, job participation, experimentation, investigation, and the like, including manipulation. It is so easy to prove the point by referring to occupations like meal selecting, deep-sea fishing, steel manufacturing, or glider flying, which are not likely to be "explored" or manipulated in a school-shop environment.

3. Facilities and a teaching load that will permit constant vigilance in the diagnosis of individual pupils will permit the achievement of another objective, *guidance.* Any and all kinds of guidance may accrue if the experiences are rich enough. The soundness of this purpose for shop work is seen in any environment that will permit *activity* along with real problems resulting in intriguing situations.

4. All persons are *consumers.* Automobiles, lawn-mowers, unbalanced meals, silk socks, bait-boxes, catcher's mitts, motion pictures, canned goods, furniture, and thousands of other articles are all made, advertised, sold, and consumed. They constitute the "*products of industry* and should be selected, used, and cared for with intelligence, economy, efficiency, and satisfaction," according to Bonser. (See ref. 2.) There is scarcely any other single purpose as important or fundamental as this one. Will it be considered in your program?

5. The range of shop work offered should also be broad enough to permit the achievement of a number of *specific abilities,* largely of a "handy-man" nature. Although frequently limited in character, there nevertheless are a large number of specific things of a technical nature that all youngsters should know and be able to do, particularly about the modern home. This objective is frequently referred to as "household mechanics," but in many respects constitutes a broader mastery than that, and should be so planned in the equipment layout. It is frequently achieved through a range of experiences in several phases of the shop.

6. The conscious development of worth-while *habits and attitudes* is an objective that is increasingly stressed in more dynamic forms of education where personal and social traits are so rapidly and easily developed. One cannot succeed far without possessing desirable personal and social characteristics, and the nature of a shop should be planned to permit their development in all teaching situations.

7. Snedden has given us the general *developmental* concept which the writer has stated in part as "developmental experiences through manipulative and many other kinds of activities that are introductory to various phases of the world's industrial work, particularly those experiences which come during the formative or adolescent period of life that function in physical, intellectual, social, and other phases of individual growth." (See ref. 9 for fuller discussion.)

8. *Vocational training* for the proven per cent of cases that drop out before graduation is of serious importance, as is also the junior, or introductory, character of the training received by those who graduate and go on into such junior employments as are found on all sides. Correct habits, attitudes, skills, and appreciations concerning any occupation should be the goal when such a field is studied or experienced. The broad and flexible character of the shops shown permits vocational training of an introductory or exemplary sort if such is desired. Examples of boys entering carpentry, mill work, salesmanship, boat building, machine shop, printing, and apprenticeship in many fields could be cited.

9. Another and final objective to be considered in any shop program on junior and senior high school levels is what we have termed *curricular integration.* Such a purpose influences method as well as content and the equipment installation. The present-day school shop attempts to combine or integrate the immediate and future occupational interests of individual youths with the interests of the home, the community, industry and the school.

References to more complete statements that should constitute the educational program are given in the short bibliography. Even with so cursory a treatment in mind, it is now possible to briefly summarize some of the constructive enterprises of the school shop.

II. *Manipulative Aspects of Shop Work*

If the program just defined is to be achieved, then careful attention should be given to what phases of shop work to install. Analyses of 1930 census data to note the supply and demand of labor, range of industries and the like; needs of the pupil as indicated by his interests and capacities; nature of the products of industry, such as automobiles, canned goods, plate ware, and furniture, that are consumed by everyone; types of employment likely to be afforded by local industries and business houses; and other criteria, are indicative of the need for careful study.

Many (over eighty) specific units of work or industrial representations are to be found in present-day school shops. Some of the things that fire youngster's imaginations include sculpturing, printing, camp and other types of quantity cooking, glider building, boat constructing, wood turning, pottery, molding, electricity, stage carpentering and electricity, scene and other kinds of oil painting, rustic cabin designing, block printing, experimental apparatus making, manip-

ulating or tinkering with gasoline automobiles, and engine-lathe turning, to mention some of the most intriguing.

Do these answer or in part meet the requirements of the educational program just reviewed for school-shop work? Only constant evaluation and reconstruction of curricular materials and teaching methods can furnish a satisfactory answer. But, for all present purposes, it is believed that the instances just cited, coupled with certain principles of school-shop planning, will furnish us with sufficient bases for making and judging a "layout," particularly the ones shown.

III. *Statement of Principles to Be Noted in Shop Planning*

Briefly, and without considering the following points as fitting into any logical order, consider the school-shop plan:

1. **Orientation**—north, but feasible in any direction where even light can be had through clear glass windows, and preferable on the first floor with an exit to an outside driveway.

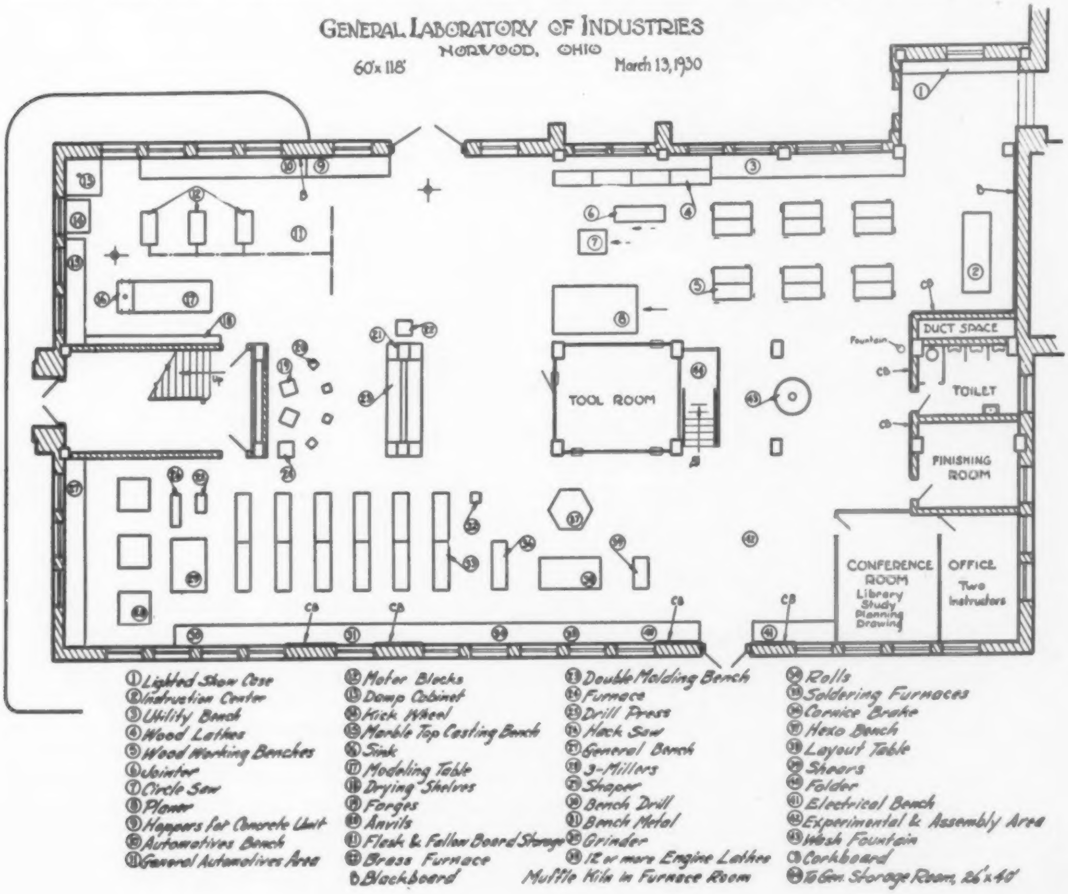
2. **Room width**—varies from 15 to 60 feet or more in actual practice. Classroom and narrower widths are certainly to be avoided. The use of bays, special wings, separate buildings, gymnasium widths, and classroom plus corridor plus classroom widths, as shown in the Norwood plan, suggest solutions. The ratio of width to length may vary from 1 : 2 to 1 : 1 and contain reasonably large areas (2,000 to 7,000 square feet) in cosmopolitan schools of 300 pupils and larger.

3. **Room length**—variable to meet the suggestions just made. Rooms vary from 20 to 250 feet in length. Discipline and fatigue elements as well as construction costs would question lengths greater than 100 feet.

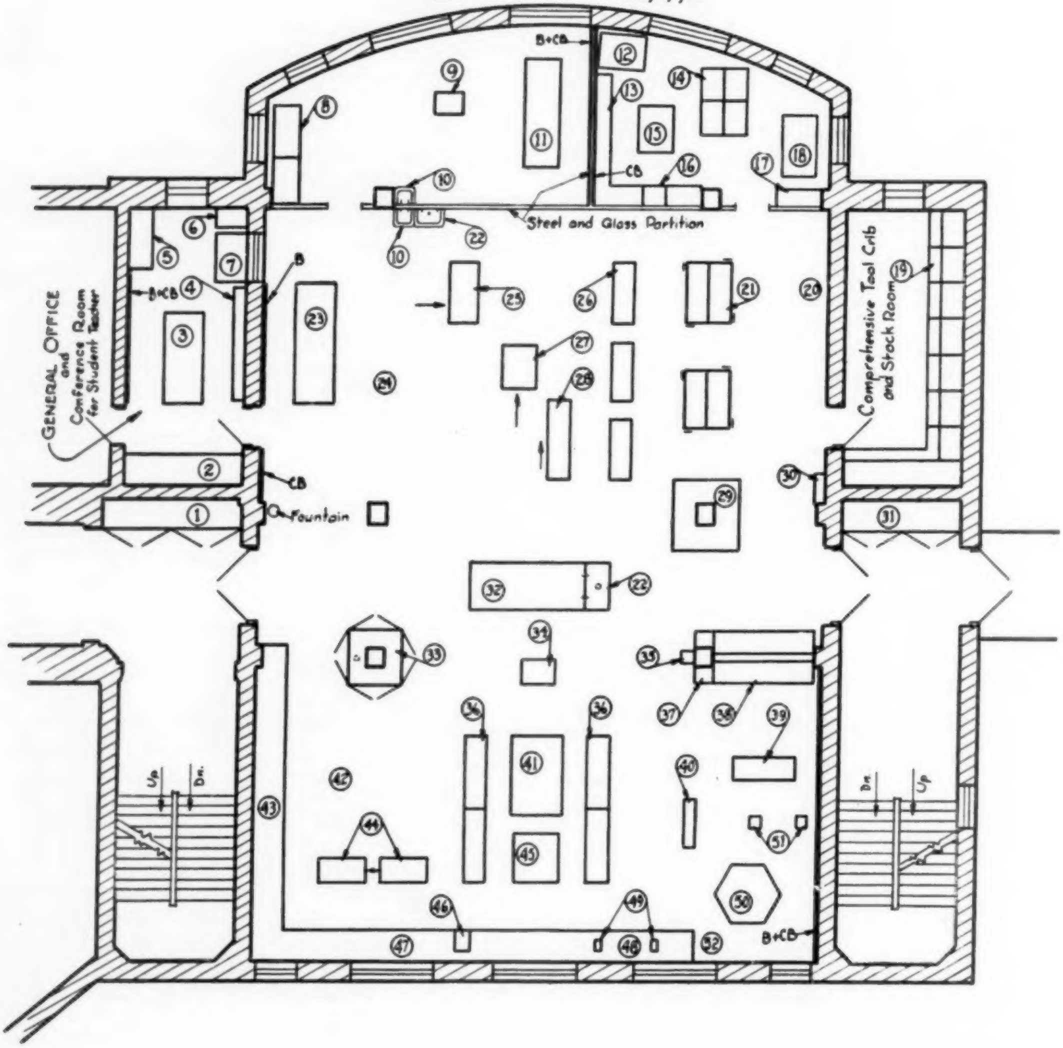
4. **Ceiling height**—usually greater than that of the classroom, just as the gymnasium, auditorium, and natatorium have their particular requirements. Odors, dirt, noise, heat, construction under way, storage, and machine operation require heights not less than 13 feet. Ceilings should be coated with acoustic plaster or other sound-absorbing materials.

5. **Lighting**—often determined by law, but with as much natural light coming from as many sides as possible, and artificial light clear of shadows at bench height to the extent of 15-25 foot-candles in shops and 25-50 foot-candles in drawing rooms.

6. **Gas, water, electric, drain, air, and exhaust outlets**—should be provided when needed. In both the large shops shown, the need for exhaust systems is evident when the range of clean



LABORATORY of INDUSTRIES
University High School
OHIO STATE UNIVERSITY
48'×77' May 1, 1930



1. Display Case
2. File & Storage, Built-in
3. Conference Table
4. Bookcase, Built-in
5. Supply Cabinet
6. Filing Cabinet
7. Desk
8. Drawing Cabinets
9. 15-Ped. Dwg. Tables
10. Lavatory
11. Demonstration Table
12. Paper Cutter
13. Work & Storage
14. Type Cabinets
15. Stone
16. Stitcher
17. Ink Cabinet
18. Press
19. Unit Cabinets
20. Lumber Rack

B Blackboard

21. Wood Working Bench
22. Sink
23. Instruction Center
24. Experimental Area
25. Band Saw
26. Wood Lathes
27. Circle Saw
28. Jointer
29. Plaster Bench
30. Sandpaper Cabinet
51. Anvils
31. Paper Cabinet, Built-in
32. Ceramic Bench
33. Damp Cabinet
34. Kick Wheel
35. Grinder
36. Engine Lathes
37. Flask Storage
38. Molding Bench
39. Triple Furnace
40. Hack Saw

CB Corkboard

41. Shaper
42. Automotives Area
43. Automotives Bench
44. Motor Blocks
45. Miller
46. Drill Press
47. Electrical Bench
48. Sheet Metal Bench
49. Soldering Furnaces
50. Hexo Bench
52. Sheet Metal Machines

and dirty work carried on is so great. Placement in agreement to other parts of the building and to other dirty or clean areas is essential. This may be noted in all three plans shown. The tendency is to run the various lines and conduits overhead where they can be kept dry and accessible.

7. **Partitions**—of steel 36 to 48 inches from the floor with glass above for a distance of 42 inches or more, continuing in steel or glass to the ceiling, are appropriate if discipline, visibility and lighting elements are considered essential.

8. **Flooring**—is still disputed. The United States Bureau of Standards bears me out in recommending the end-grain type of flooring. Creosoted or tar-covered floors are naturally not favored. Cement is undeniably fatiguing and hard on tools. Certain other special types may prove satisfactory. Hardwood floors are favored in all but the dirty units like molding, ceramics, and automotives. It is not uncommon to find two types of flooring in one room. Linoleum may be used in office and drawing-room areas.

9. **Instructional responsibilities**—in two or more teacher shops should be so arranged that logical groupings of shop units may be centralized. This would mean that a teacher who is especially well prepared in woodworking would also handle the carpentry, sheet metal and possibly concrete units, while another teacher who is a specialist in machine-shop work could also develop the automotive instruction and have general supervision of the molding and forging units.

10. **Aisles of travel**—should be four feet wide and be in sufficiently direct relation to entrances and exits to make for easy passage to and from any part of the laboratory.

11. **Recitation facilities**—may be effectively provided at any point in the laboratory at any time through the use of flat-folding steel chairs which may be checked out of the comprehensive tool-crib. In the University High School plan shown, the drawing room at the upper left will be used for *discussions, study, planning, reading, research, conferences,* as well as drawing. The Norwood plan provides a special room for this purpose.

12. **Bulletin and blackboard facilities**—should be provided where possible, as shown. "B. and C. B." refers to the cork strip bulletin board over the usual slate board.

13. **A lighted showcase**—with plate-glass shelves, is built in wherever possible and placed near the main entrance to the shop. The instructional possibilities of such a case are great for the type of program previously described.

14. **Storage space**—is important and should always be provided. Lockers for projects may be built under long wall benches, as shown in the Norwood drawing. Provision may be made on balconies, in hall lockers, in special storage rooms or even in a tool-room. A dead storage room in the basement or attic is essential to all shops of the type shown. Provision for lumber storage in the shop itself as shown at "20" in the University High School and near the door in the "Small" Shop, is increasing in favor. Lumber will be stored at the foot of the stairs at "44" in the Norwood plan. Oils and all smaller supplies are kept in the steel tool-crib. Rod iron and steel may be kept in the crib or under wall benches.

15. **An experimental and assembly area**—is essential to the program previously discussed for youngsters who want to work on larger items like boats, airplanes, gliders, cabins, playground equipment, garages, stage scenery, engines, and the like.

16. **Flexibility**—this principle is stressed and the companion principle of light types and extensive ranges of equipment rather than fewer and intensive installations is seen as sound procedure, particularly as changes may be deemed desirable from time to time. Food, ceramic, textile, nautical, aviation, and other new units of shop work for adolescents 12-18 years of age are not uncommon, and are frequently more easily justified than more traditional types.

17. **"Laboratory of Industries"**—this name is in keeping with the point of view for shop work expressed in Part I.

18. **The teacher's office**—one that he thinks of as his "sanctum," is important if better shop work is to be expected. He must study or diagnose boys from all angles and enjoy the stimulation of a place to think, that is apart, yet in direct control of the laboratory, as seen at "7" in the University High School plan.

19. **Square feet per pupil**—should never be less than 50. The Norwood plan provides 116 square feet per pupil. If flexibility and an experimental unit are to be maintained, then the larger area is necessary. The University High School provides 75 feet per pupil.

20. **The tool-crib or tool-storage**—should be centrally placed and of easy access to all parts of the laboratory. Large items like flasks, forging tongs, shovels for molding or concrete work, jacks for automotives, and stakes for sheet metal work, may well be left at the unit in question, wherever provision for this is made. An efficiently operated tool-crib of a comprehensive sort will materially correct the general confusion of small tools and many other loose items that are too commonly found in a comprehensive-type shop.

21. **Miscellaneous provisions**—as washing facilities in the shop, safety provisions at a saw or jointer, a safety cabinet, the utilization of corners and pillars, provision of a drinking fountain, a toilet in a large shop, a central sharpening bench and grinder, a floor drain when needed, and combination locks, are all essential items in a good plan. The planner should frequently ask himself whether there are any features of his plan that will encourage misbehavior and accidents. What items of equipment are found near the tool-crib where there will be constant passing to and fro? Are they dangerous or of the precision type like a saw or miller? If so, consider a change.

IV. *The Examples Shown and Further Considerations*

The examples shown are three of the plans suggested and used by the writer in Ohio. The first is in reply to a request from members of the State Department of Education for a modern shop plan for the small high school typical of rural areas. Many of these schools were visited, and the accompanying plan was drawn as a practical solution for the usual corner basement room of classroom width. Occasional schools are not furnished with gas or electricity, but these are in the minority where any type of shop work is attempted in this state.

The second example was planned for a 1,200-pupil junior-senior high school in a cosmopolitan-industrial area where fifty per cent or more of the graduates go on to college. A printing laboratory and general drawing and design room were also planned and included in this school at Norwood, Ohio, a suburb of Cincinnati. The plan will be in operation in September, 1931. The larger doors shown lead directly onto a concrete drive. The plan is unique for its use of two classrooms and a corridor width. There are classrooms and halls overhead.

The third example shown is the current proposal of a final arrangement for a comprehensive shop layout in the new University High School to be opened here in September, 1931. Here again, the plan is unique in school-shop planning, because it has a gymnasium rather than a traditional classroom width. A natatorium has been planned underneath and a gymnasium is overhead. The shop is on the first floor and will presumably enjoy an outside double-door entrance near "31." The plan is suggestive because it includes so many units or industrial representations. Finishing that cannot be accomplished in the main area will be carried on in the drawing-room. A ceramic kiln of the muffle type will be placed in the basement in both this and the Norwood school. It will occupy 36 x 52½ inches and will be 36 inches high. A lined flue and insulated wall are provided.

Equipment and tool lists, specifications, and requisitions have been omitted from the discussion this time. An adequate treatment of the details of this part of the job for the examples shown would take as many more pages. Such a subject would be controlled by an extensive analysis of the jobs and other manipulative aspects of shop work.

Many shops of this type are developed too rapidly. They require strong teachers and from two to five years to get under way. A sound policy requires *gradual* installation and expansion, if there is any question in the mind of the administrative head or shop teacher regarding their ability to see it through.

V. *Professional References*

The following references are appended for further study.

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8. Rogers and others: "Trade Foundations." Manual Arts Press, Peoria. 1919. 521 pp.
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10. Warner, William E.: "Activities Centered Around the General Industrial Arts Laboratory." *Educational Research Bulletin*. 7: 15-17, January 11, 1928.
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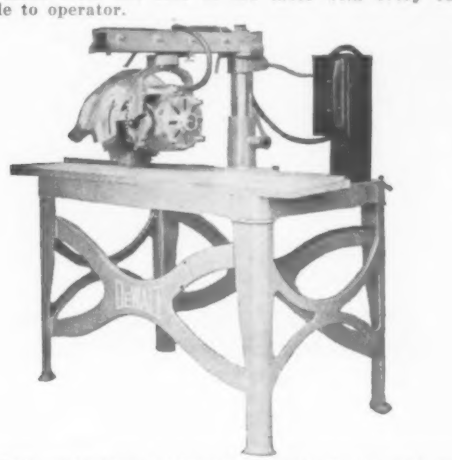


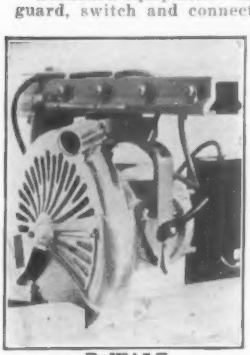
WONDER WORKER MOUNTED ON METAL TABLE

Specifications

Depth of cut (depending on model)	1" to 6"
Width of cut (standard arm)	16"
Width of cut (long arm)	24"
Motor—A.C., 1, 2 or 3 phase—or D.C. for 110 or 220 volts	1 to 5 hp.
Speed of motor	3600 r.p.m.
Table	29" x 59"

Saw blades and tools direct driven on motorshaft.

Standard equipment—Motor, table, saw blades, safety guard, switch and connecting cord.



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A smaller edition of the DeWalt Wonder Worker performing same operations but of only 2" material capacity. Carefully designed with safety guards to provide maximum protection. Equipped to operate from light socket.

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Designed on new principle. Light, portable machines. Full Timken bearing. Completely guarded. Ball-bearing guide above and below table.

Table adjustable to 45 degrees. Can be direct motor-driven with floor standard or as bench machine, either with or without motor. (Complete pulley guard used in the latter case.)

DeWALT MORTISER

Easily adjusted. Accurate and rapid in operation. Equally effective for either mortising or drilling. All moving parts adjustable to compensate for wear. Hand feed on sliding table. In and out adjustment. Table tilts to any angle, right or left, with scale and indicator to show degree of tilt.

Specifications

Chisel adjustment (above table)	14"
Motor	½ hp.
Length of sliding table (overall)	20"
Horizontal travel	18½"
Chisel stroke	5¾"
Weight	260 lbs.

Standard equipment—one ⅜" chisel, proper wrenches, motor and switch, extension cord and plug, rolling table.

DeWALT 6" JOINTER

Direct driven with positive locking fence, full automatic guard and rabbetting ledge. Full ball bearing. Safety head with 3 balanced knives. Extra long table. Both tables adjustable. 6" Jointer suitable for use with floor standard—or bench type for use with motor or pulley driven.

Specifications

Lgth. of table (overall)	41"
Fence	4½"x32"
Rabbetting ledge, adjustable	0 to 6"
Motor, A.C. or D.C. current	½ hp.
Speed	3600 r.p.m.

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Section X

LABORATORY

Science Laboratories in Secondary Schools

BY F. W. HART

PROFESSOR OF EDUCATION, UNIVERSITY OF CALIFORNIA

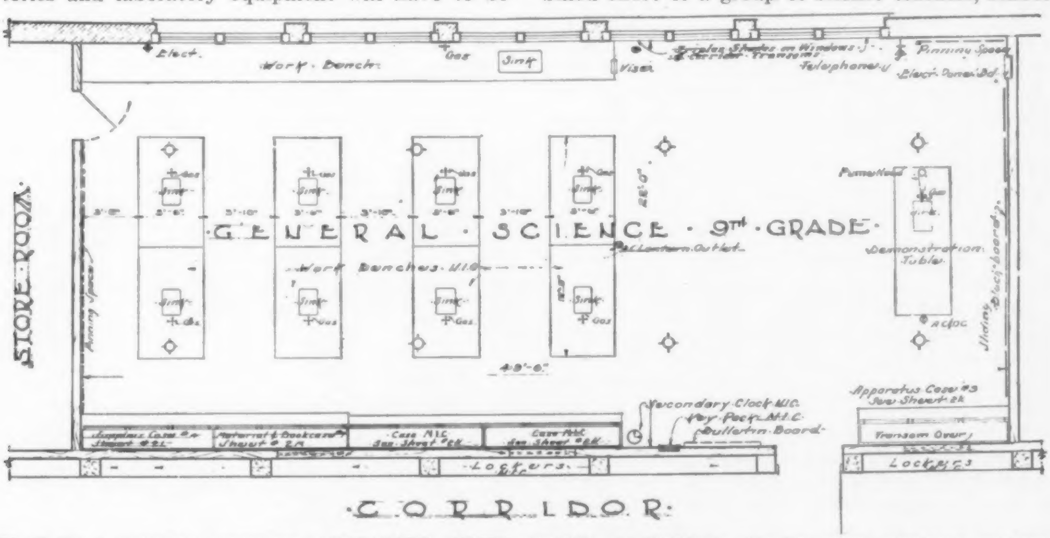
AND

WILLARD E. GIVENS

SUPERINTENDENT OF SCHOOLS, OAKLAND, CALIF.

THERE is no one best science laboratory. In the planning of school buildings we may approximate standardization of certain non-specialized instructional rooms with some degree of assurance that we are providing the optimum arrangement of physical facilities, but with the present wide range of variation in both content of specific science courses and the methods of teaching science, no uniform laboratory layout can be formulated that can be characterized as "the best." Therefore, until such time—if such time should and does arrive—as science content and science teaching methods are uniform, laboratories and laboratory equipment will have to be designed to serve the particular courses as given. In the meantime, emphasis should be placed on the flexibility and adaptability of such laboratories, so that the changes in the programming of science courses, differences in content and variations in methods of teaching, may be met with a minimum of inconvenience to instruction, and a maximum of economy in alteration of plans.

The plans presented in this article are not, therefore, represented as being an ideal or the best solution of the problem of housing science courses equally adapted to any and all school situations. On the contrary, they are the product of the combined effort of a group of science teachers, school



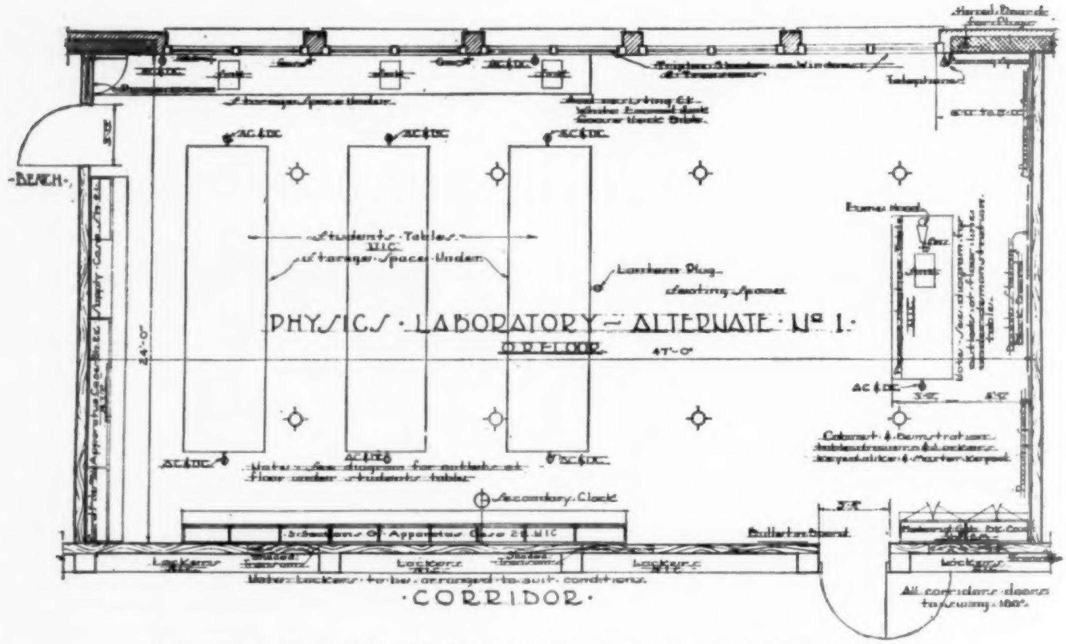
PLAN OF A GENERAL SCIENCE LABORATORY (NINTH GRADE), AS WORKED OUT FOR THE OAKLAND, CALIF., PUBLIC SCHOOLS

Built-in equipment:
- 1 material and book case
- 1 key cabinet
- 1 secondary clock
- 8 students' tables
- 1 demonstration table
- 1 apparatus case
- 1 work bench

Estimated cost, $1,768.00

Furniture:
- 32 tablet arm chairs
- 1 teacher's small desk
- 2 oak chairs
- 1 waste-paper basket
- 4 three-gallon stone jars with lids

Estimated cost, $241.95



THE STANDARD PHYSICS LABORATORY FOR THE OAKLAND PUBLIC SCHOOLS

Built-in equipment:		Furniture:	
1 material and book case	1 work bench	1 teacher's small desk	4 three-gallon stone jars with covers
1 key cabinet	1 supply case	2 oak chairs	1 waste-paper basket
1 secondary clock	1 apparatus case	32 tablet arm chairs	
1 demonstration table	1 card file		
8 students' tables		Estimated cost, $241.95	
Estimated cost, $3,633.00			

executives, school building planners and educational consultants in a particular city school system. The plans therefore embody the elements believed to be essential to science teaching as defined and administered in that particular system. They are the plans worked out in, and adopted by, the Oakland Public Schools, Oakland, Calif., as standard layouts to be followed by architects in the planning of buildings for Oakland's secondary schools.

Points of Divergence from Common Practice

The features of special interest—the points of divergence from the more common practices are:

First, each laboratory is designed to serve all the requirements of the particular courses for which it is planned, namely, individual laboratory exercises of the pupils, teacher demonstrations, lectures, discussions and recitations. No separate science lecture rooms or science recitation rooms are required as auxiliary rooms to the regular laboratories. This arrangement presumes an organization and a method of teaching in which individual laboratory work, recitation, demonstration, and discussion are integrated into one continuous process, each phase of which is subject to the direction of the instructor in charge without regard to the limitations of time, period, or available facilities such as prevail when recitation and demonstrations are conducted in lecture rooms on stated days of the week and laboratory exercises are conducted in special laboratories on other days.

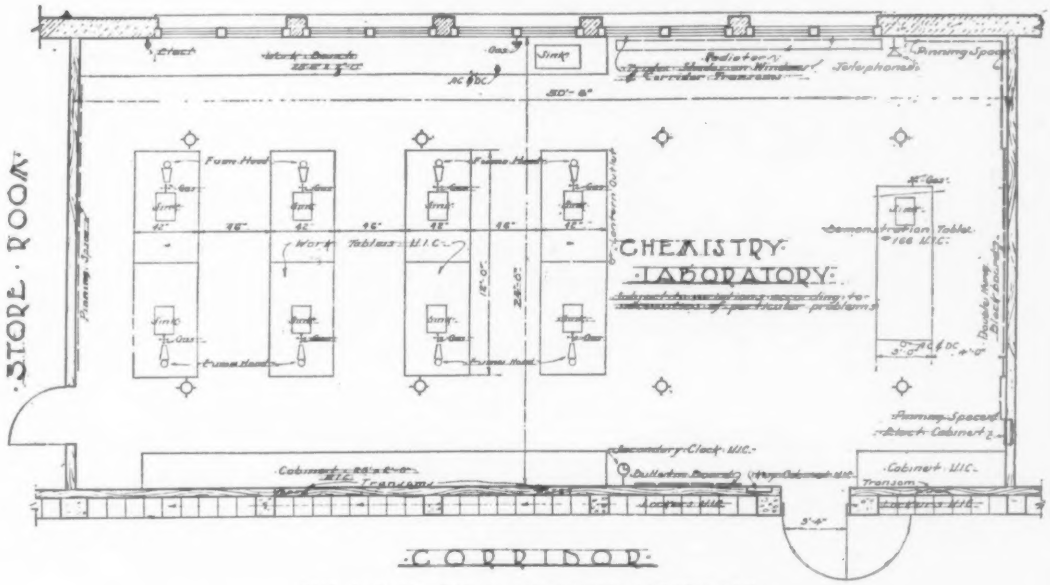
A check on the reaction of science teachers to the efficacy of the combination unit as contrasted with the lecture or science classroom and separate laboratory was made by asking all the science teachers in Oakland to answer the following questions and justify their answers. The questions were:

"We are anxious to secure your opinion as to the advantages of the two types of science laboratories in the Oakland School Department, viz., (1) where the lecture and demonstration room is separate from the laboratory, and (2) where the lecture, demonstration room, and laboratory are combined.

1. Have you had experience with type 1? ———
2. Have you had experience with type 2? ———
3. Which type do you prefer? ———
4. Reasons for your preference. ———"

Fifty-two science teachers were questioned, with the following results:

1. Forty-two of the 52 teachers had taught in laboratories of type 1 and 51 had taught in type 2.
2. Forty-one of the teachers had taught in both types of laboratories and therefore had a basis of experience upon which to express a preference. Of these, 33 preferred type 2 (the combination plan) 6 preferred type 1, and 2 gave conditional answers.
3. The reasons given for the preference checked are represented by the following direct quotations:



THE LAYOUT FOR A CHEMISTRY LABORATORY

Built-in equipment:

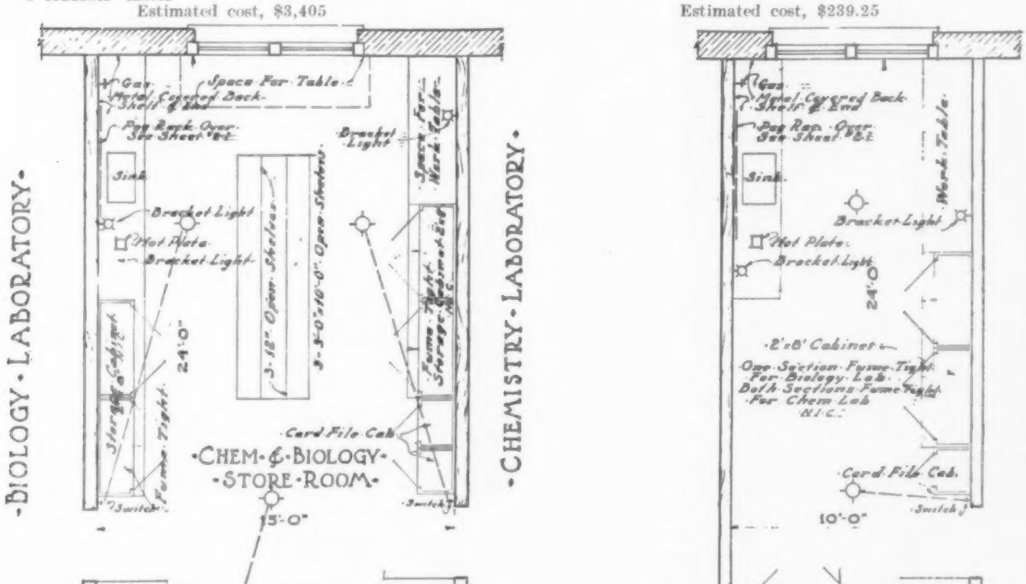
1 material and book case
1 secondary clock
1 demonstration table
8 students' tables
1 key cabinet
1 work bench
1 apparatus case

Estimated cost, $3,405

Furniture:

32 tablet arm chairs
1 teacher's small desk
2 oak chairs
1 three-gallon stone jar with cover
1 waste-paper basket

Estimated cost, $239.25



CHEMISTRY AND BIOLOGY STOREROOMS

Chemistry storeroom

Built-in equipment:

1 peg rack
1 work bench with sink, gas and hot plate
1 card file
Storage cases

Estimated cost, $248.50

Furniture:

1 work table

Estimated cost, $12

Biology storeroom

Built-in equipment:

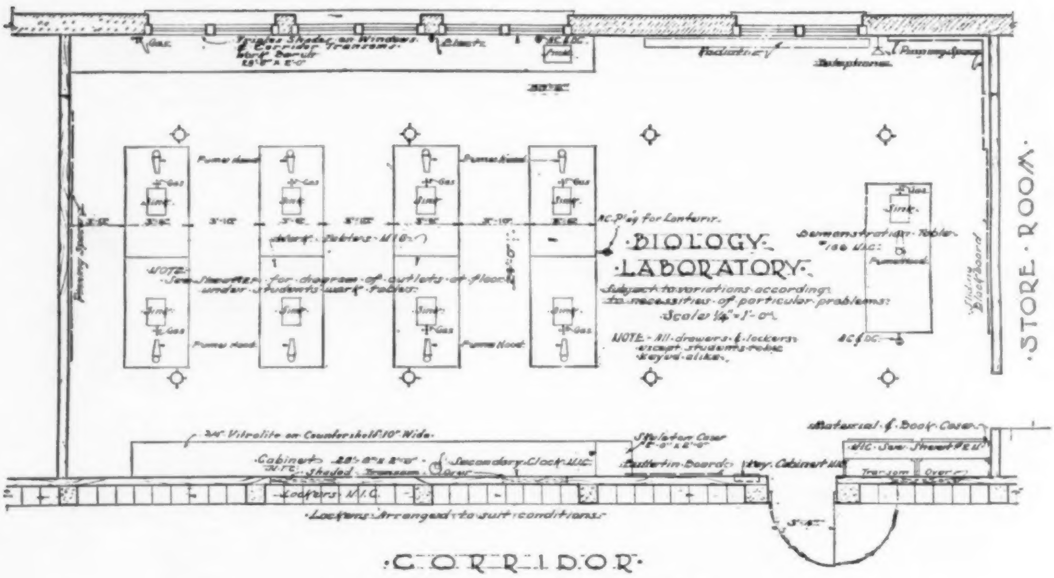
1 peg rack
1 work bench with sink, gas and hot plate
1 card file
Storage cases

Estimated cost, $248.50

Furniture:

1 work table

Estimated cost, $12



THE STANDARD BIOLOGY LABORATORY

Built-in equipment:		Furniture:	
1 material and book case	1 work bench	1 teacher's small desk	1 waste-paper basket
1 demonstration table	1 apparatus case	2 oak chairs	32 tablet arm chairs
1 clock	1 skeleton case	4 three-gallon stone jars with covers	
8 students' tables			
Estimated cost, $2,045.00		Estimated cost, $241.95	

(1) With the hour period, teacher demonstration is used practically every period. Type 2 permits student laboratory to be performed in a logical order and not on set days.

(2) Very often the lecture, demonstration and the regular laboratory work can be combined to an advantage. The demonstration and lecture materials (viz. chemicals, apparatus, etc.) do not have to be moved to another room.

(3) Science work does not divide itself mechanically, but supplements one with the other. It is impossible to illustrate theory and laboratory work as it should be done when the laboratory facilities are separate. The laboratory, in type 1, becomes an activity apart from the development and observation of subject matter.

(4) Type 2 permits of a more flexible classroom procedure and diversified activity, and the convenience in having the apparatus concentrated in one room.

(5) It is possible to divide the class into groups, part of which may be doing laboratory work, and all groups being supervised by the teacher at once. A question arising in discussion may be settled at once by a laboratory experiment.

(6) Classroom discussion and problems, and experimental work, cannot be tied up as closely in type 1 as in type 2. The laboratory work must be left until the laboratory day. In type 2, problems can be formulated and solved in the laboratory the same day. This method, in my experience, is more effective than the procedure you must follow in type 1.

(7) The student should turn to the laboratory for the purpose of answering a question or proving a principle. He should be able to do that when the question comes up and not wait until tomorrow. The laboratory work and the discussion should not be torn apart by the use of different rooms.

(8) Type 2 makes the program much more flexible. The laboratory work can be done at the time it fits into the program rather than on certain days reserved for it, which must be the case under type 1. The same applies to demonstration work.

(9) Separate lecture and demonstration rooms are survivals of university practice. They tend to emphasize the idea that laboratory and theory are two separate courses. We have learned in psychology that learning by wholes is more economical. In the separate case we have to first learn practice, then learn theory, and finally comes the task of connecting up.

The second point of departure from the traditional type of science laboratory is the number of pupil stations provided. Each major laboratory is designed to accommodate at one time a minimum of 32 students as over against the customary 24-unit laboratory. This change is in harmony with the general tendency to increase the size of classes in high schools. The problem of adequacy and convenience of storage space for equipment and supplies has been given special consideration with these plans, and the working layout from the standpoint of both instructor and pupil is highly satisfactory.

The plans, together with standard built-in equipment and furniture lists, are reproduced on these pages, not with the idea that they will serve with equal satisfaction the needs of other school systems, but that they may supply suggestions that may be helpful to other schools in working out plans adapted to their particular needs.

High School Laboratories for Chemistry

BY L. W. MATTERN

McKinley High School, Washington, D. C.

Types of Laboratories.—It is the purpose of this chapter * to set forth the commonly accepted standards of equipment for high school chemistry as determined from the replies to a questionnaire sent to a considerable number of experienced instructors in high school chemistry, and also from consultation with several laboratory experts of wide experience in advisory work relative to laboratory layouts. Three types of high school laboratories are considered: the large school which needs more than a single chemical laboratory of the 24- to 32-student type; the medium school which has pupils enough in chemistry to use a single laboratory of the above size for this subject only; and the smaller school which must use its laboratory for two or more sciences.

A school, for instance, with 1,000 or more pupils will have from 500 to 600 enrolled in the four laboratory sciences, about 100 to 125 in chemistry, if given in the third year of the high school course, and an additional 30 to 60 if a second year in chemistry is given. These figures are based on studies in high school enrolment made by the U. S. Bureau of Education.

A high school with 100 students in first year chemistry needs laboratory tables for at least 35 students working at the same time, and, preferably, tables for 50 students at a time. A program which provides for two separate students in different class sections using the same space at the laboratory table is easily made. One for three students to use the same space is possible but more difficult. Standard chemical tables are made, however, with cupboards and drawers for three sections of students as well as for two sections.

This means that a school with more than 100 pupils in chemistry must have one laboratory larger than the 24- to 32-student standard-sized laboratory, or two or more laboratories of that size. Some instructors prefer the large laboratory, others the separate smaller laboratories. Schools with about 40 to 60 pupils in chemistry need but one laboratory of the standard size. A supply room, class demonstration and recitation room, and an office for the instructors, are desirable whenever possible.

A single laboratory for chemistry and another science is not advisable, except where it is necessary in a small school. High school chemistry should be based on experimental work done during the course. The corroding fumes generated thereby are not so completely removed by ventilating systems that the instruments of other sciences are free from injury. The same difficulty arises from combination supply rooms.

The prevailing opinion regarding the two types of departments referred to favors the location of either of them on the top floor along the main corridor wherever there is the most light.

Large Departments

Location of Rooms.—The location of a supply room and an office between the classroom and the laboratory is generally preferred. Figure 1 represents such a plan. Supplies are thus conveniently placed for distribution to the laboratory or the classroom, and the office is conveniently near.

Programs are so arranged that certain days are designated for the classroom and others for the laboratory. The few occasions when it may be desirable to have students pass between the classroom and the laboratory do not warrant a special passageway within the department, as the main corridor can be used for that purpose. Part of the office may be used for analytical balances which should be covered. If desired, a balance room may be constructed on the laboratory side by lessening the space occupied by the supply room and the office.

Laboratory.—The advantages of a single large laboratory over two or more small ones are: it saves partition space; it gives flexibility in providing for classes of varying sizes; it makes it possible for one instructor to be in the laboratory while another one goes to the supply room; it prevents the duplication of chemical supplies other than the common reagents and apparatus at the student's table; it renders all hood space available at the same time; it gives a broadening and inspiring effect for one class to see the more advanced work of another class; and the large laboratory helps to develop the advantage of solidarity among teachers in the departmental work. Figure 1 shows a unit laboratory which may be increased to a large one or multiples of the same size.

The disadvantages of the single large laboratory for from 60 to 100 pupils is that confusion is apt to take place, particularly if enough instructors are not assigned to the room. This is increased by students going to a single supply room at one end of the laboratory for supplies. Two smaller laboratories, each in full charge of a single instructor, with the supply room between the two laboratories, do away with the confusion.

* This article on High School Laboratories for Chemistry is a portion of Chapter XIII of a Report of the National Research Council Committee on The Construction and Equipment of Chemical Laboratories. The material is reprinted by permission of The Chemical Foundation, Inc., New York, from its 340-page book, published in February, 1930, on "Laboratory Construction and Equipment."

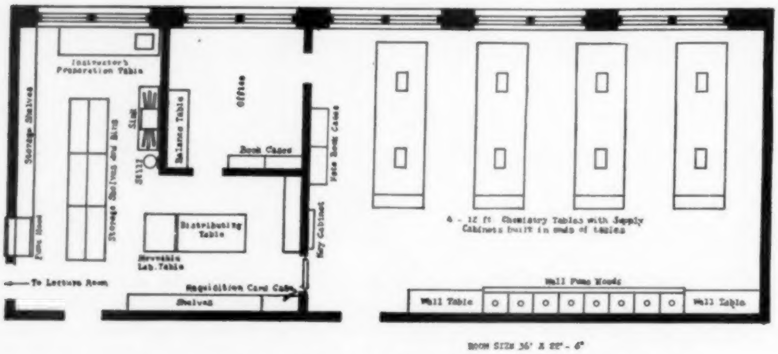


FIG. 1. OFFICE BETWEEN LABORATORY AND LECTURE ROOM

Aisle Space.—No aisle space is indicated between the table and the window side of the laboratory in Figure 1, but there is one wide main aisle (5½ feet) between the ends of the four tables (12 feet long, 4 feet wide and 3 feet high) and the hoods (2 feet wide) on the corridor side. This affords ample space for general passage into the aisles (4 feet to 5 feet wide) between the tables which extend to the plumbing along the wall. One large aisle economizes floor space and increases table space near the window. However, many prefer two aisles, one on each side of the laboratory. It is a good arrangement if space is available. In this case a long table 18 inches wide may be run under the windows, to be used for rough weighing, and shelving for chemicals may be placed between the windows.

Tables.—Figure 2 shows the specially made type of table used in Figure 1. It provides a working space for eight students at one time on the five-drawer and one-cupboard plan. One good-sized drawer (14 x 6 inches) is sufficiently large to hold the apparatus generally used in a one-year course of high school chemistry, and one cupboard with a half-shelf or a shelf on two sides gives ample space for the larger pieces of apparatus in common use by the five occupants. Some prefer several small drawers to a single large one for each student.

Location of Chemical Supplies.—It is important that these be conveniently at hand at all times. The tendency is to have the reagent shelf single rather than double, so that the instructor may have a clear view throughout the laboratory. Common reagents in 250-cc. bottles are usually placed on the students' desks. A complete set of chemicals (500-cc. bottles of solutions and salts) used in the entire course can be arranged on low racks with two rows of bottles at the ends of the tables. (Cf. Figure 2.) These bottles may be arranged alphabetically. This general distribution tends to prevent the congestion of students. Such a set once supplied needs little attention except for the few that are most often used. This economizes the time of both the teacher and the students in going to the supply room during laboratory hours.

Shelving may be placed along the main aisle for the distribution of such supplies, yet such space is valuable for hoods and blackboards, and a portion of this wall is sometimes required for wall ducts. They may be placed between the windows on the window side of the room. Scales may be kept on shelves along the windows or on the ends of the tables beneath the bottle racks and removed to the part of the table near the racks for weighing purposes, or on tables adjacent to the wall hoods.

Table Tops.—For high schools wood tops with special treatment to make them acid-resisting, or soapstone, is generally used; to a lesser extent, tile is used. The best wood tops are made of hard western birch cut in narrow slits, tongued and grooved and glued up. This prevents warping, and if only the best materials are used, there is little danger of cracking and joints opening. If properly treated with the so-called standard acid-resisting finish, they are only slightly liable to chemical action from ordinary reagents. They should be treated with raw linseed oil several times a year and given a treatment of the original acid-resisting materials every five or six years if necessary.

The soapstone should be well selected and free from veins of limestone or other materials subject to chemical action. The tile should be vitrified, and the materials in which they are laid should be supported by lead sheeting. The combined thickness of the tile and its supporting material should be approximately two inches.

Sinks.—Soapstone, chemical stoneware, enameled cast iron and vitreous china are used in high schools, with a preference for the first two. A good size for high school use is 20 inches long, 12 inches wide and 12 inches deep for end sinks

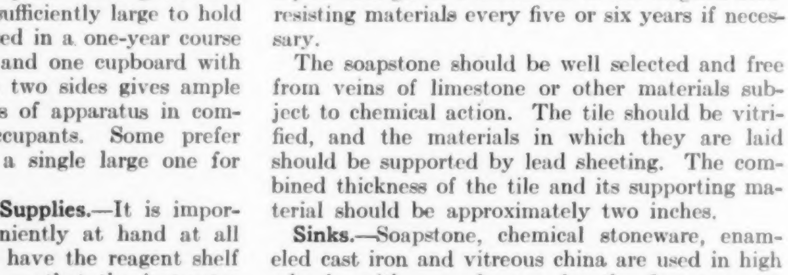


FIG. 2. LABORATORY TABLE

on the tables, and 15 inches long, 14 inches wide and 6 inches deep for center sinks. A plug and overflow and strainer for the sink outlets are imperative as a protection to the plumbing.

Care of Waste Materials.—This troublesome problem has a variety of attempted solutions, none of which will work in the midst of poor discipline. The general method is to place earthenware crocks of 3- to 5-gallon capacity at convenient places. Some use catch jars on the tables, draining into center troughs and to the sinks, or movable sink baskets made of resistant metal, suspended in the sink under the end of the trough or resting in the center sinks. Fiber buckets instead of crocks are sometimes used. One-gallon waste jars on desks is still another method.

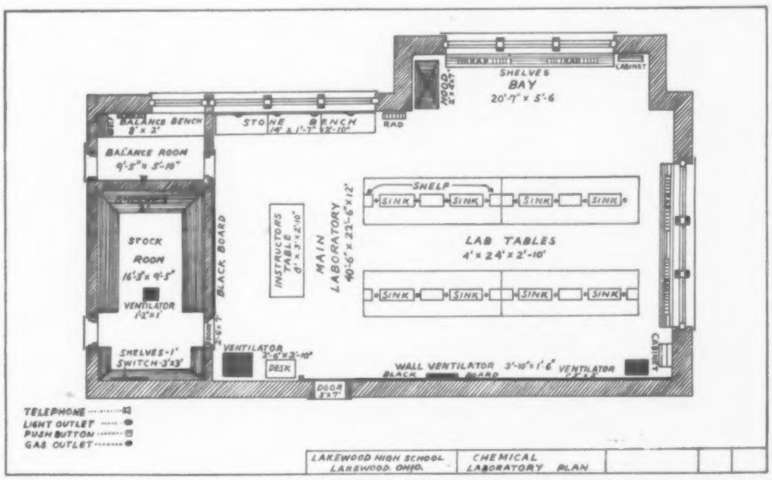


FIG. 3. LABORATORY WITH DEMONSTRATION TABLE

Hoods.—The ventilation system supplying fresh air for the laboratory should be passed on by an engineer competent in such matters, for it is very essential to a good high school laboratory that the ordinary fumes be removed quickly and plenty of fresh air supplied to the students. In addition, fume hoods are necessary for certain experiments. One 2-foot hood for every six students is satisfactory.

High school chemistry teachers seem to favor one suction fan for all hoods. This is placed in the attic and is controlled by electric switches in the laboratory. Hood bottoms in order of preference are soapstone, built-up wood tops similar to the table tops, lead and tile. The various materials used for ventilating flues are stoneware, lead, painted sheet iron, Russian iron, tin well-painted, and tile.

High school hoods should be divided into 2-foot sections. Glass or asbestos wood is preferred for the partitions. Gas cocks are inside at the rear. Hoods may be built in recesses or against the wall, the plastered walls thus forming the back of the hood. In this case baffle-plates should be used. These may be made of asbestos wood or stone and must be firmly secured at a distance of from 3 to 4 inches from the wall with openings through it at the top and bottom. It is well to give all plastered walls and asbestos boards in the hoods two coats of aluminum paint. The flues may be made of galvanized iron, not less than 20 gage, and treated on the inside with asphaltum varnish, as should also be the outside of ducts exposed to the fumes. Care should be taken to make the joints fume-tight.

Supply Room

This is a place where economy of space should not be too severely exercised, as supplies and their administration form an important factor in chemical instruction. This room should open into the laboratory, with a split door so that the upper part can be opened while the lower part with a table board on top is closed; or, better, it should have a window through which supplies are issued. A cabinet should be located near this door or window, with labeled drawers for numerous items. There should also be handy drawers for beakers, funnels, test tubes, etc. Also, in a convenient place, a requisition card cabinet should be placed, with a card for each student's supplies. Each card should have a signed list of the apparatus received upon entering the course, and space for entering additional articles that may be issued during the course. These cards should be numbered corresponding to those of the keys and laboratory lockers, and notebook racks.

It is found advantageous by some instructors to have shelves constructed with three steps 4 inches high and 4 inches wide for chemicals, as well as deep shelves for apparatus. Rolling bins and cupboards beneath the shelving serve as good storing space. With modern lighting facilities and proper location of shelves with respect to window light, the shelving may extend from the floor to the ceiling and can be easily reached if a rolling or portable stepladder is provided. Since chemicals can be bought to a better advantage in larger quantities, and since it is very annoying to run out of supplies in the midst of laboratory work, there should be plenty of storage space to have a surplus on hand.

Teacher's Work Table.—This should be located in the supply room on the window side. All progressive teachers will want some place designated as their own where new experiments and demon-

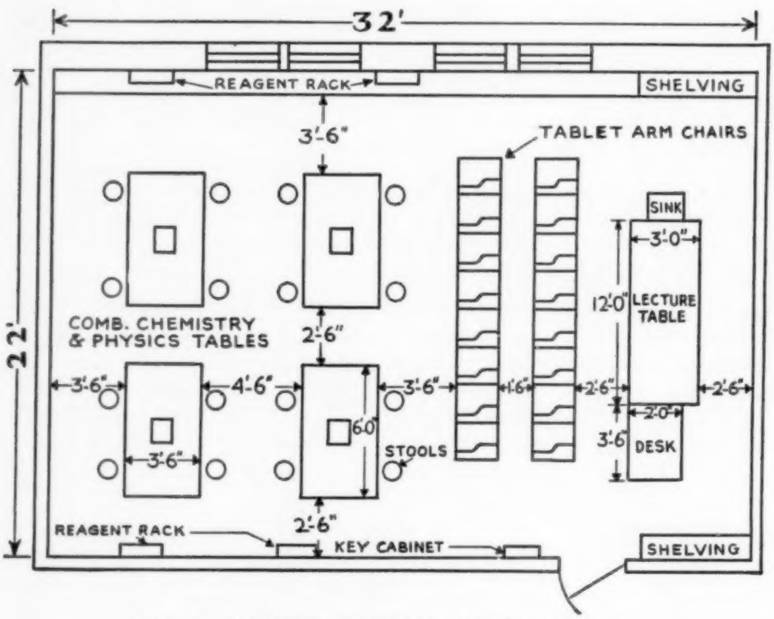


FIG. 4. COMBINED CLASSROOM AND LABORATORY

strations may be devised, and where some experimental problem in chemistry may be investigated. Also, at the opening and closing of the semester the work table may be used for the sorting of apparatus.

Large Sink.—The supply room should have a sink approximately 4 feet long, 2 feet wide and 10 inches deep, with drain boards and back splash of the same material. All should be mounted on 1¼-inch galvanized iron pipe standards so that the top of the sink shall be approximately 3 feet from the floor. The drain boards should be approximately 2 feet long, and the splash back should extend the entire length of the sink and drain boards and extend 16 inches above the sink.

Water Still.—The supply room is a good place for the distilling apparatus to furnish distilled water for the laboratory. It should be so placed as to drain into the large sink. When high-pressure steam from the power house is available, it may be led directly into the cooling coil and furnish a supply of distilled water. Otherwise a gas or electric water still may be used and if properly constructed and installed it will not become a fire hazard.

Office.—The office should be sufficiently large so that each teacher may have a desk and so that a cabinet for records and cases for books common to all teachers of chemistry, and reference books for students, may be included. In case of more than one teacher of chemistry, a large office for all teachers seems better than a small one for each teacher. Conferences and departmental solidarity may thus be promoted to better advantage.

Balance Room

High school teachers are about equally divided on the matter of having a balance room. The proper care of a high-grade balance demands protection from the atmosphere of a general laboratory. Scales sufficiently accurate for general high school work may be obtained for from $12 to $15. Several very sensitive balances for teachers' use or that of an occasional student can be placed on a small, well-supported wall table in the office. They should be protected when not in use by a frame covered with black oilcloth. Of those high school teachers advocating a balance room, the average opinion as to the size is 14 x 10 feet. Balance tables should be 39 inches high and 18 inches wide, firmly supported along the sides of the room, or a table double that width along the center of the room.

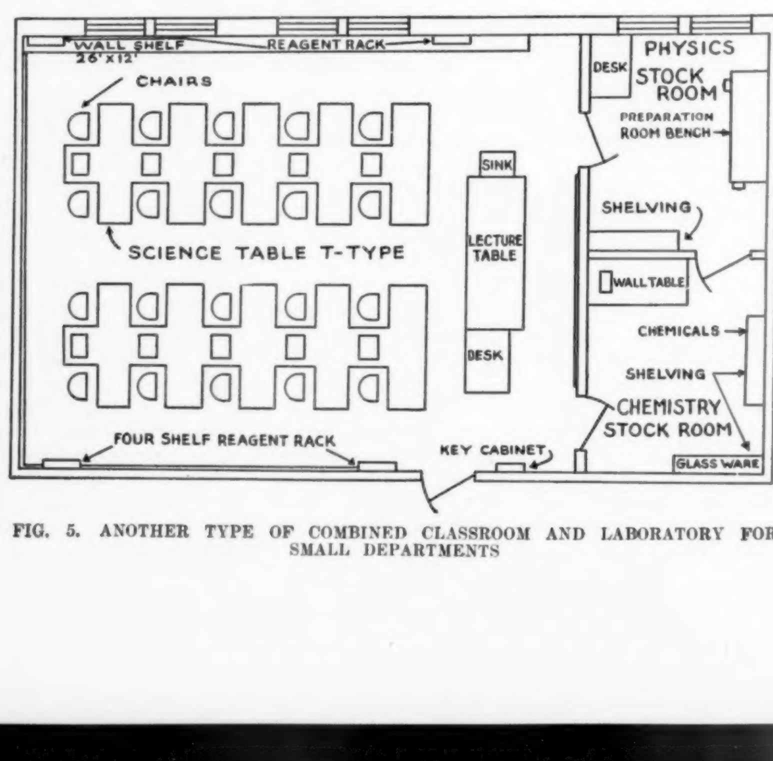
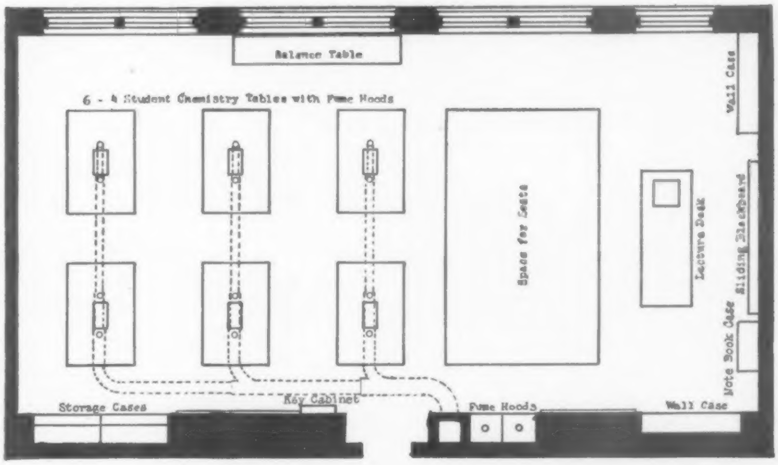


FIG. 5. ANOTHER TYPE OF COMBINED CLASSROOM AND LABORATORY FOR SMALL DEPARTMENTS

Class and Demonstration Room

It is estimated that a room 30 x 22 feet with an aisle on each side 3 feet wide and allowing 22 inches square for a chair will be large enough to seat 36 students. Should the seats be raised, the first elevation for chairs should begin at least 4 feet in front of the classroom table and these elevations, 4 inches to 6 inches high and 36 inches wide, should continue to the rear of the room. However, a room of this size scarcely needs raised seats. In the rear of the demonstration table a door should open into the supply room. A sliding blackboard at the rear of the demonstration table is a convenience. A hood is also a convenience, but not an essential. In some schools one is arranged with a sliding frosted window on the classroom side and a clear sliding window on the supply room side. This hood can be used not only in connection with classroom demonstrations, but also in connection with the work table in the supply room. A door for the exit of pupils should open into the main corridor at the aisle space in front of the demonstration table, but if raised seats are not used, it may be at the front or rear.

In most common use is a demonstration table 8 to 12 feet in length, 3 feet wide and 3 feet high, with one large sink 18 inches long, 15 inches wide and 12 inches deep, having a pneumatic shelf. Gas and electric outlets should be on the back of the table. At the rear of the room provision should be made for projection apparatus. Figure 3 shows one type of large laboratory.



ROOM SIZE 44' x 22'-6"

FIG. 6. COMBINED LECTURE ROOM AND LABORATORY

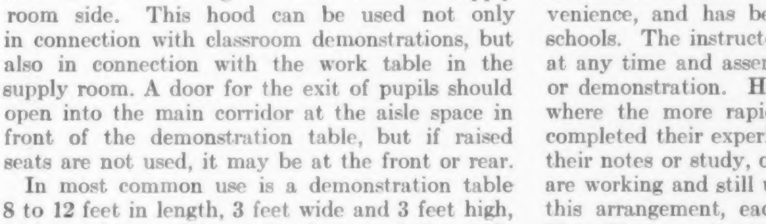
Small Departments

Combined Classroom and Laboratory.—In small high schools the classroom and chemical laboratory are often combined in one room. This is done by providing space at one end of the room for an instructor's demonstration table and for tablet arm-chairs for the class, or by using the special type of furniture described below.

Figure 4, in which the location of work tables, teachers' demonstration table, wall tables, shelves, blackboard, keyboard, all with their dimensions, is given, and the sizes of the room, aisle and chair space are also stated, as well as Figures 5 and 6, are types of such laboratories.

This classroom space in each laboratory is a decided educational advantage because of its convenience, and has been adopted in many large schools. The instructor may stop individual work at any time and assemble his class for instruction or demonstration. He also has a place available where the more rapid workers, when they have completed their experiments, may sit and write up their notes or study, out of the way of others who are working and still under his observation. With this arrangement, each laboratory requires from 25 to 35 per cent more floor space than under the old arrangement mentioned above, but the space for a separate lecture room is saved. A saving of even 25 per cent of this space may be had by using the special type furniture mentioned below.

Special Forms of Tables.—By the use of furniture especially designed for this purpose and found satisfactory during the past half-dozen years in over 1,000 high schools in the country, the student work tables may be used for seated work, and the separate lecture room or classroom space at the end of the laboratory omitted. The tables are made up of T-shaped units, each unit for two students with one sink in common. All students face the instructor's desk. The chairs for the pupils are placed under the ends of the transverse tables when not in use. The only additional space over that necessary in the ordinary laboratory is that required for an instructor's demonstration table. This means usually a length from 6 to 8 feet more than would be required otherwise.



THE ASSEMBLY OF A UNIT

Storeroom Keeping for a Department of Chemistry

BY CLIFFORD D. CARPENTER

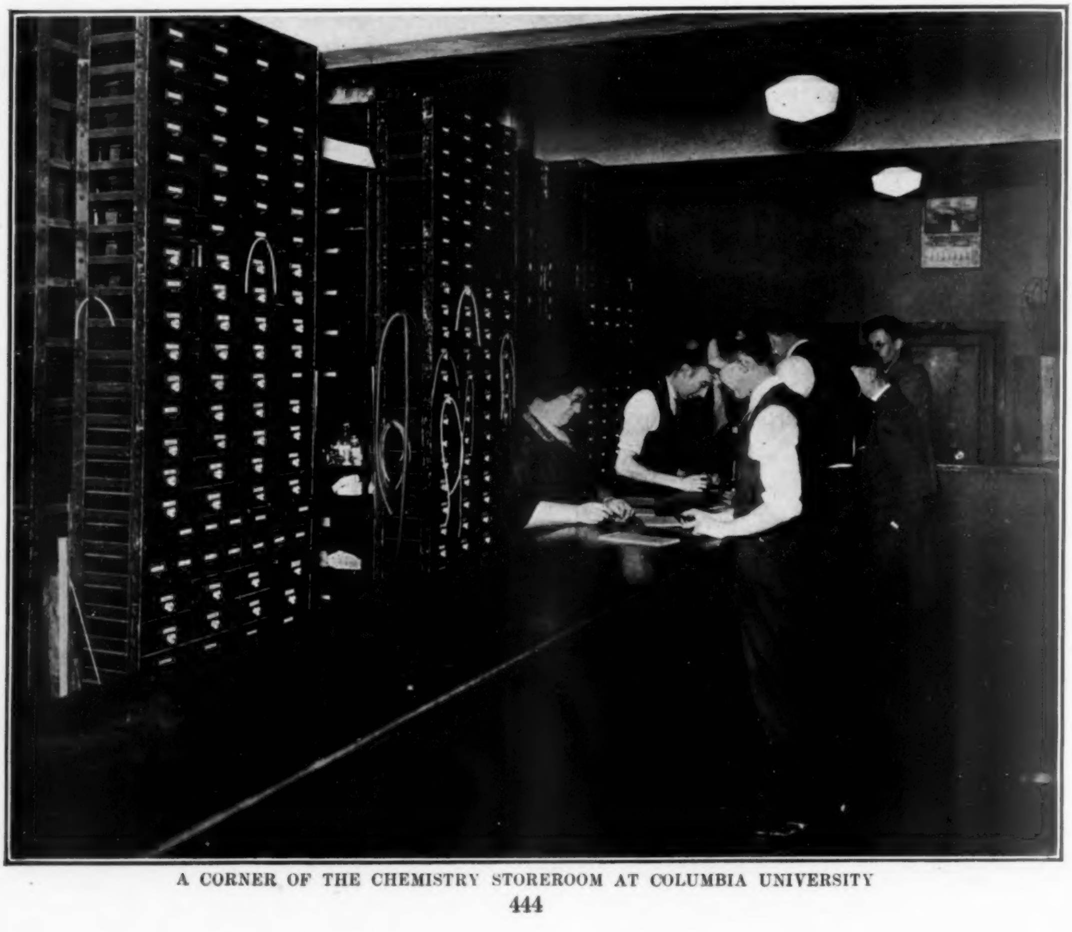
PROFESSOR OF CHEMISTRY, COLUMBIA UNIVERSITY

THE storeroom keeping in the Department of Chemistry of Columbia University in the city of New York has been developed as one of the arms of effective teaching. The present system was started in 1911 by the late Professors Alexander Smith and Thomas B. Freas, who are responsible for its main purposes and features. This development has been participated in by all members of the staff.

It has been continuously kept in mind that laboratory work in the elementary courses is largely verifying by experimentation the truth of statements found in textbooks, and in order that a student may be able to verify as many such statements as possible, he should have a proper supply of chemicals and apparatus at hand. Not only was the convenience of the student considered, but the release of instructors from the storeroom keeping makes it possible for them to do more effectively the business of teaching and have time and energy left to apply to study and research.

As a member of the staff enjoying the advantages of the system, I am convinced of its importance and value both to students and to staff. A very brief picture of the essential features of the system is given in the illustrations and discussion following.

The storeroom keeping has developed into two branches—the seasonal, at the opening and closing of each session, and the daily over-the-counter service. The seasonal service involves giving out complete kits of apparatus and chemicals to each student at the opening of the session, and the taking-in of kits at the close of the session. The over-the-counter service meets the needs of stu-



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The records in the files in the Chemistry Stores are considered as correct unless the duplicate is presented when an error is claimed.

Enter catalogue numbers where possible. See Information Booklet Part II-III.

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The price is to be entered at once by the Chemistry Stores clerk.

It is understood that the signer of this card has a copy of the "General Notices Concerning Supplies, Desks, Equipment. Etc." (Information Booklet Part I) and applies for supplies under the conditions therein imposed.

Under "Kind of Supplies" use description in Information Booklet Part II or III.

Enter catalogue numbers where possible.

THE OBVERSE AND REVERSE OF THE CREDIT AND DEBIT CARDS, WHICH ARE SIGNED IN TRIPLICATE

dents who must replace broken apparatus or those needing a new supply of chemicals when the original supply in the kit has been wasted in an unsuccessful experiment.

Whenever a student enters a laboratory course in chemistry, he is given an individual kit of apparatus and chemicals sufficient for the needs of the course. It should not be necessary for him to go to the storeroom again until the close of the session. Actual experience has shown that the time saved from running to the storeroom and to the side shelf for chemicals makes it possible for each student to perform half as many more experiments than were done previously. Then, too, there is less commotion, visiting, and other drawbacks to independent work by the student. While there is no charge for the use of apparatus or for chemicals allotted for each course, a student makes a deposit to guarantee the return of the apparatus, against which extra chemicals and missing apparatus are charged. Each student thus has an open account, so that whenever he needs to replace equipment or secure a new supply of chemicals he goes to the counter and signs a card in triplicate. He keeps one, the second is kept at the counter, and the third goes to the bookkeeping files. If a student wishes to borrow an extra piece of apparatus, he signs the same kind of card; and when he returns the apparatus, he is given credit on another card. At the present time the charge cards are green and the return or credit cards are red. Copies of the cards are reproduced above.

At the close of the course, the apparatus is returned, the student's account is closed and a refund is made of his deposit or that portion not used to replace apparatus missing or charged during the session. All research students open an account, making a deposit at the opening of each session against which all equipment not returned, and chemicals used above a certain allowance, are charged. Each member of the staff not a student, is not required to make a deposit but has an account on the books which is handled in the same manner as that of students so far as charging and crediting apparatus and chemicals taken out and returned. At the close of each year each member of the staff receives a statement covering all items drawn out and returned.

The storeroom serves some 200 graduate students registered in graduate laboratory courses and 1,000 undergraduate students, the Lecture Demonstration Department and the staff. By the close check of materials going out and not returned, it becomes a matter of simple bookkeeping to make out orders for purchasing the necessary new materials in order to keep in stock a supply sufficient for all needs.

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DURIRON should **not** be confused with iron. In analysis it differs more from iron than bronze from brass. Its advantages, over other materials for handling acids and corrosive liquors, are its greater strength, its universal corrosion resistance, and the fact that it does not depend on a coating, lining or glaze, but is wholly and equally resistant clear through its structure. Properly made joints REMAIN TIGHT.

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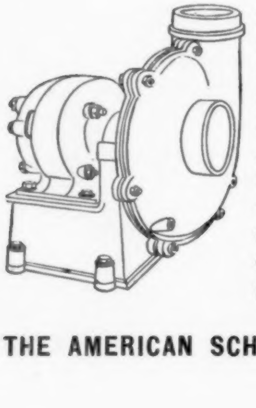
CORROSIVE TESTS. In 1919 tests were made on DURIRON over a period of 120 days' duration, using all the corrosives in general commercial use. These proved that the life of DURIRON Pipe handling corrosive wastes is virtually unlimited. A number of DURIRON installations, carrying the most corrosive liquids, have been in service for over ten years and show no signs of deterioration. Our data on the corrosion of other materials is at all times available to the architect.

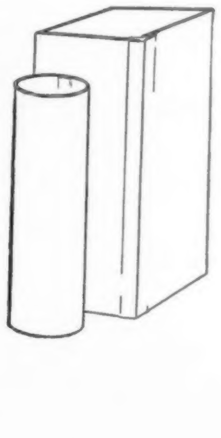
DURIRON VENTILATING FANS. Ventilation of laboratories, laboratory hoods, pickling rooms and places where it is necessary to remove corrosive and noxious fumes, require an exhauster that will not be affected by the gases handled. All parts of DURIRON Fans that come in contact with the fumes carried are DURIRON and are unaffected by vapors or condensate. DURIRON Fans are built in four sizes, having approximate capacities of 60, 450, 1500 and 4000 cu. ft. per minute.

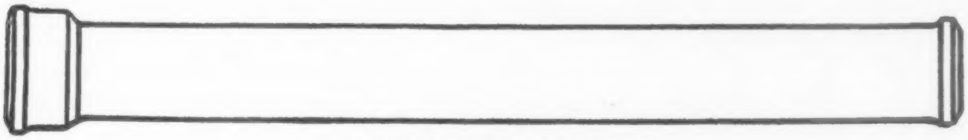


WHERE USED. DURIRON should be specified for the waste lines from educational, hospital and industrial laboratories. In structures devoted to crafts such as: photoengraving, electroplating, etc., battery repair stations. Drainage from commercial kitchens, especially from garbage "raking pans." Waste lines from industrial plants. For sink outlets, traps, horizontal piping and stack entrance fittings in medical buildings housing physicians, surgeons and dentists. Waste lines through cinder concrete where corrosion attacks on outside of pipe. House drains for combination sanitary and acid wastes. Roof vents exposed to coal smoke and moisture or any extreme atmospheric corrosion. All wastes where absolute insurance against failure is important, due either to corrosion or rust—such as memorials, public buildings, and those erected to endure indefinitely.

ENGINEERING SERVICE. Our broad experience with all conditions in the handling of acids and acid wastes, and our knowledge of building and plumbing codes and regulations, enables us to offer valuable co-operation in the layout of acid waste lines; to make definite recommendations on ventilating problems, and to be of help in all matters where corrosion must be considered.

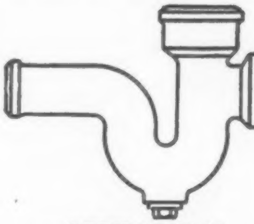
DURIMET FUME DUCTS. DURIMET is a chrome-nickel-silicon steel which has a wide range of resistance to corrosive fumes. DURIMET sheet is ideally adapted for use in ducts handling fumes from battery rooms, chemistry laboratories and a wide range of industrial processes. It is not affected by atmospheric corrosion, does not require painting or coating.



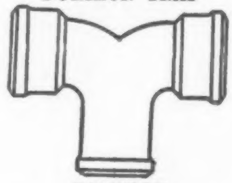


DURIRON DRAIN PIPE

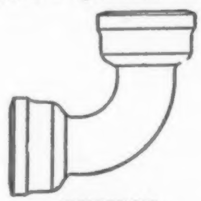
DURIRON DRAIN PIPE AND FITTINGS possess many advantages: Easily installed and familiar to plumbers, DURIRON pipe joints **stay tight**, a factor lacking in many other acid-handling materials. Require no protective coatings inside or outside. Not necessary to encase in concrete, provide drip pans or otherwise prepare for failure. Elaborate supports not needed. Lines may be concealed in walls and ceilings where desirable. Fills all code requirements for sanitary drain, and may be used for dual service of acid and sanitary line. No other material may be so used. Does not warp nor sag from heat. No discoloration of walls when run in partitions. DURIRON Pipe Joints, properly caulked, will not loosen under ordinary building vibration. Its hardness is such that it is not scored by sharp solids carried in solutions. DURIRON drain lines, once installed, are permanent. Complete stocks always maintained, assuring immediate deliveries. Compared to extra-heavy cast iron soil pipe, the cost of a DURIRON installation, including labor, is about three times as great. This cost is but a small fraction of one per cent of that of the building and it assures permanent freedom from repairs or replacements due to corrosion, in addition to insuring the finish from damage by leaking waste lines. With other materials, repairs and replacements afford only temporary relief, and are a continuous charge on maintenance. Complete stocks of drain pipe and fittings in all sizes to, and including, 8 in. The 10, 12 and 15 in. sizes are supplied promptly on order.



DURIRON TRAP



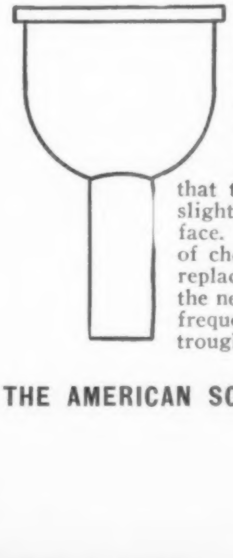
DURIRON DOUBLE QUARTER BEND



DURIRON DOUBLE HUB QUARTER BEND

DURIRON "Y" BRANCH

DURIRON RECTANGULAR SINKS. These sinks are furnished with bottom outlet to fit DURIRON Sink Outlet Fitting, which is included in the price of the sink. Steel wall brackets to fit all sizes are available. Rim widths, ½ inch; thickness ⅝ inch. Made in four standard sizes. Specials furnished promptly on order.



DURIRON HEMISPHERICAL SINKS or bowls are finding favor in chemistry laboratories when used in fume hoods or in tops of tables. When set in a hood, one bowl should be placed in each compartment, recessed so that the top of the sink rim is slightly below the working surface. When used in the tops of chemistry tables, these sinks replace the trough. This avoids the necessity of repairs which so frequently occur in stone or lead troughs.

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Leading schools throughout the country are using Kewaunee equipment for the teaching of Physics, Chemistry, Biology, Electricity, Drawing, Art, Domestic Science and Manual Training. It is the preferred equipment for all laboratory use, for the following reasons:

1. It is scientifically designed for the greatest possible pedagogic service.
2. It comfortably accommodates the maximum number of students.
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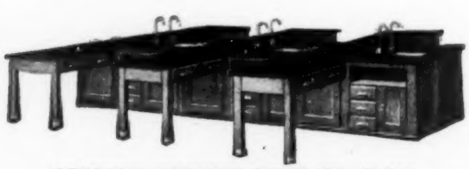

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If you wish, we shall be pleased to help you decide what is most practical and economical for your institution. We have been giving this helpful service to schools of all kinds for the past 23 years.

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Acid Proof One-piece Laboratory Sinks.

Acid Proof Ventilating Flue Caps.

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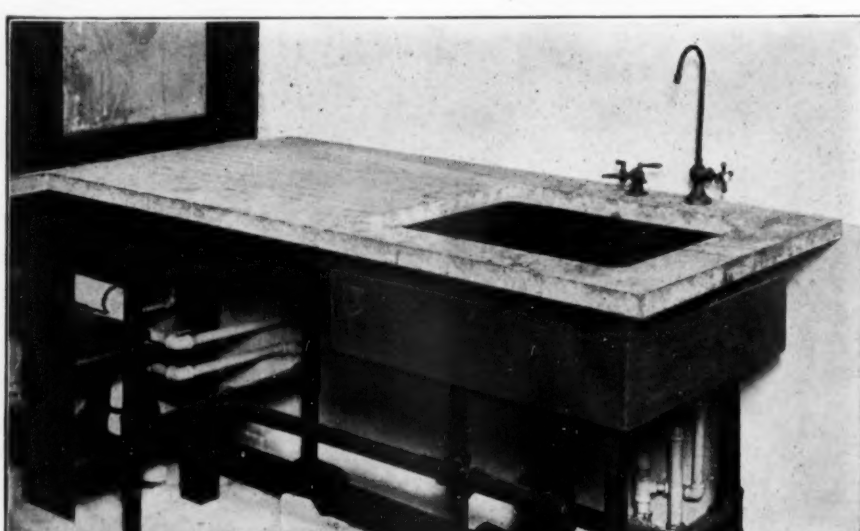
KNIGHT-WARE is a tough, homogeneous and thoroughly vitrified clay product which is GUARANTEED to withstand the action of acids, alkalies, chemicals and all corrosive solutions, weak or strong, hot or cold. Further we GUARANTEE KNIGHT-WARE to be free from defects and satisfactory in EVERY respect.

KNIGHT-WARE Laboratory Sinks

Our Sinks are made entirely in **one piece** and are entirely **without** seams or joints. All inside surfaces are **smooth** and well **glazed** and corners are all well rounded making them easy to clean and keep clean. Outlets are generally made **integral** with the body of the Sink so that the cost of tail-pieces as well as a joint is eliminated.

KNIGHT-WARE Sinks are made entirely by hand and are not **cast** or made in moulds. This enables us to make Sinks to your exact order in any dimensions wanted. Sinks can be had with or without Backs or Drainboards and with a type of Outlet best suited for your needs.



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Available in all bores from 1 inch up to and including 60 inches. We can supply any standard type Fitting that can be had in any other material and are often called upon to supply special Fittings.

KNIGHT-WARE Pipe and Fittings are easily and economically installed. They are hung much the same as any other pipe, one hanger only being required per Fitting or length of Pipe. The bells on our Pipe are **deep** and well **corrugated** and our method of joint packing assures you of a perfectly acid- and leak-proof joint.

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We offer you knowledge and practical experience gained through scores of KNIGHT-WARE installations. This service is yours for the asking and without obligation.

FIGURE 271—ACID PROOF BELL AND SPIGOT PIPE

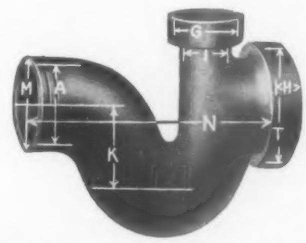


FIGURE 267—ACID PROOF BELL AND SPIGOT RUNNING TRAP WITH CLEANOUT

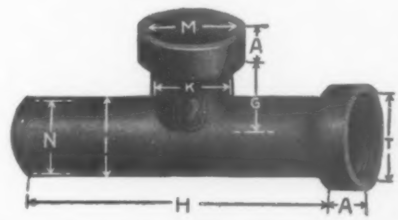
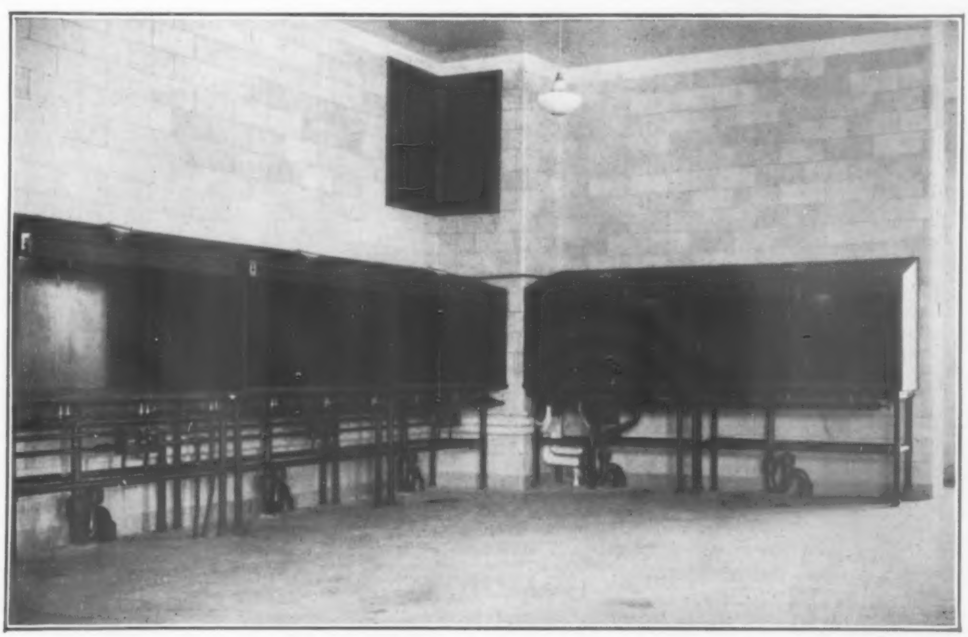


FIGURE 273—ACID PROOF BELL AND SPIGOT TEE FITTING



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PRINCETON UNIVERSITY

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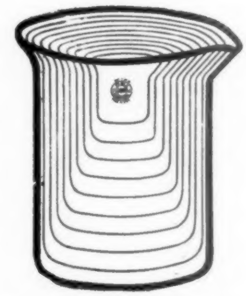

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See next page for Natural Science Department of Kny-Scheerer Corp.

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The Sheldon catalog shows over 20 designs of Art and Mechanical Drawing Tables with a range of capacity from one to eight classes. They are built of material 20% heavier than offered by other manufacturers and every principal frame joint is re-enforced with a bolt and nut.

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The Sheldon Catalog illustrates

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20 " " Art and Mechanical Drawing tables
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Alberene Stone, a natural quarried stone, fabricated for the following laboratory purposes:

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- Fume Hoods
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Alberene is a natural quarried stone, blue-gray in color, dense and non-stratified, chemically inert, impervious and non-staining, highly resistant to acid, alkali, flame and fire, non-absorbent and easily cleanable. It is easily machined—tongued, grooved, bored, drilled, slotted or turned—without splitting or spalling.

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Alberene Stone laboratory fixtures are built by methods possible with no other stone. They are practically one-piece structures of solid stone. Table top slabs are united by a practically invisible joint employing a strip of non-corroding metal cemented in grooves, with abutting edges of the slab ground and sealed with acid-proof cement. Fume hoods, sinks and tanks are assembled with tongue-and-groove joints held by hidden bolts and nuts and cemented. Such joints are permanently gas-and-liquid-tight.

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Every laboratory of major importance equipped in the past 30 years has used Alberene Stone wholly or in large part. Out of this large experience the Company offers an advisory service, freely available to school and university authorities and architects.

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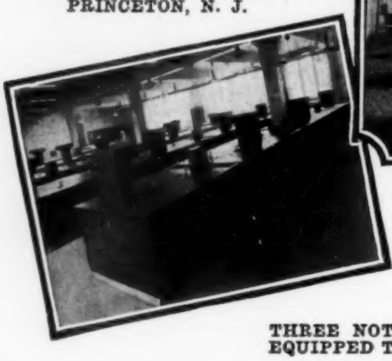

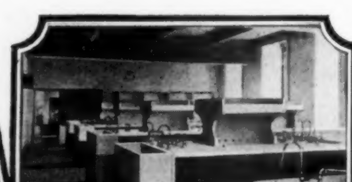

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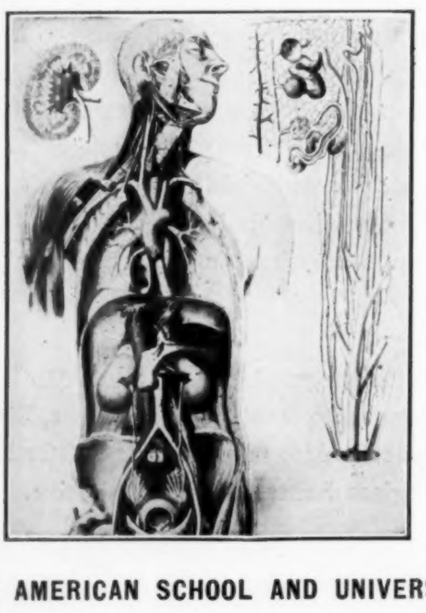

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By equipping your laboratory throughout with PYREX Ware, you will minimize breakage losses and expense, you can get exactly what you need, and will have no trouble in obtaining hurried duplications.

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Here are some of the advantages of General Ceramics Chemical Stoneware:

It is vitrified thoroughly **all the way through.** Does not depend on an applied glaze or veneer for its acid-resisting properties.

Guaranteed to be tight, non-porous and impenetrable by acids, alkalies and other strongly corrosive substances. No loss through leaks. No contamination of products. No hazard to employes or property.

Scientifically shaped and proportioned safely to withstand mechanical shock. Lasts indefinitely. Requires no upkeep or repairs.

Our large stock enables us to make immediate shipment of standard shapes and designs. Special designs can be also furnished promptly.

Guarantee

We will not knowingly permit a customer to remain dissatisfied with any transaction.

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We are prepared to contract for the erection of complete installations for the handling and storage of acids or other corrosive liquids; to furnish advice on the installation of stoneware apparatus, or to provide experienced men for the erection.

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Write for our Catalog showing complete line, dimensions, etc., also price list.

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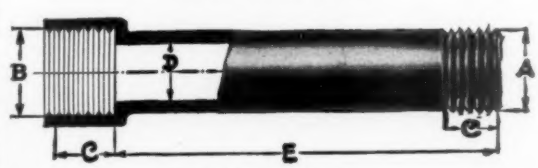
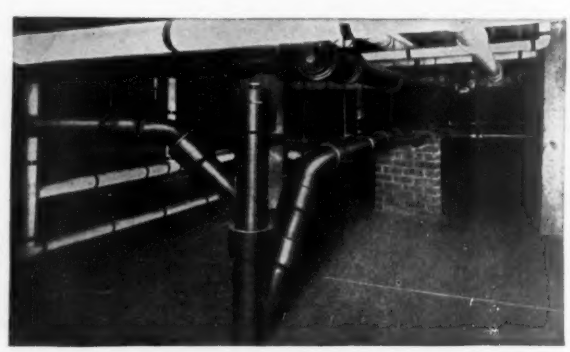


SOCKET PIPE



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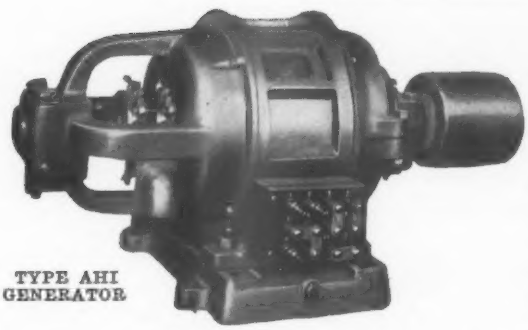

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While the usual commercial sizes of electric apparatus are available at educational prices, it is recognized that for the laboratory work of our schools and colleges the size, cost and power required for the operation, of much commercial apparatus prohibits its use.

At the same time, it is desirable that the operating characteristics and physical appearance of laboratory machines conform as nearly as possible to those of the larger units.

For this reason, the General Electric Company has given special attention to the design and manufacture of a number of different laboratory machines and devices that embody the characteristics of the corresponding commercial types.

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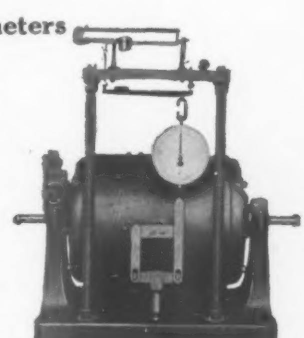

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G-E Dynamometers are considered standard equipment in research laboratories for accurate measurement of power or torque. Many technical schools also have dynamometer laboratories to give students the opportunity of becoming acquainted with their operation and the methods used throughout the automotive industry.

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No apparatus in the college laboratory is of more importance than the electric measuring instruments. A well-equipped laboratory will need an assortment of standard instruments of all types and capacities, since there is hardly an experiment performed by the students which does not require their use.

When selecting laboratory instruments, too much care cannot be given to accuracy, permanence of calibration, dead-beat indications, and legibility of scales. Of course local disturbances should not influence readings, and in many cases low internal losses are important. In the design and construction of G-E electric measuring instruments, careful consideration is given to all these details.

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The equipment consists of a storage battery, a motor generator and one or more control and distribution panels. For large schools having several laboratories, it is the usual practice to install a battery, a motor generator and a control and distribution panel in one laboratory with a distribution panel only in the other laboratories.

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The Motor Generator—We regularly furnish a motor generator to deliver 1200 watts flat compounded, at 125 volts. Larger or smaller sizes can be furnished if desired.

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Science Instructors will find this equipment of great convenience and time-saving value. In addition to the convenience and absolute control of all electrical current supply which this apparatus gives the instructor, the equipment itself is of considerable educational value. All apparatus is of most modern design and of the rugged construction necessary to meet the hard service of students' usage.

Complete detailed information covering this equipment and other electrical apparatus for science laboratories is available by writing for a special bulletin on same.

HOYT ELECTRICAL INSTRUMENT WORKS

775 Boylston Street Hoyt Boston, Mass.

For more than twenty-five years Hoyt has been building meters for every industry and for laboratory and school-room use. Hoyt instruments are well and favorably known for their dependability and ruggedness of construction which assures their long life in the hands of students.

PORTABLE VOLT-AMMETERS

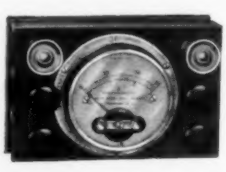
For Direct Current

Type No. 559 contains a number of special features which make it particularly adapted for school work. It is equipped with a scale 3½" long and is built on a compact bakelite base 4" x 5". Two binding posts only are provided. A reversing switch and plug-switch system of singularly simple construction but positive operation makes additional posts unnecessary. This means that after test connections are once made, no change is necessary. If connections should be reversed, it is only necessary to throw the reversing switch and the meter will read properly. If a change in scale is desired, it is only necessary to move the plug to another jack. Polarity of connection can be established as the two binding posts indicate "plus" and "minus" when the reversing switch is in normal position. The movement is of the d'Arsonval type with jeweled bearings; accuracy 1%.

STANDARD RANGES ARE AS FOLLOWS

Type	Volts	Amperes	Price
559-5	0/3/30/150	0/.600/6	27.50
559-6	0/.150/3/30	0/.300/1.5/30	30.00

ROTARY TYPE



Voltammeters of the Hoyt Rotary type have become popular in automobile service work, in radio, in railroad-signal and fire-alarm maintenance, and in fact, everywhere there is a demand for a compact rugged combination instrument of small size with a number of ranges. The design is exclusively Hoyt; and as nearly "accident proof" as it is possible to make a measuring instrument. The meter movement is in a nickeled case mounted on a suitable block, containing a Rotary switch, so arranged that as the meter itself is turned, the proper connection is made for reading its various scales. The meter has a D'Arsonval movement, sensitivity of 70 ohms per volt; with jeweled bearings; scale length: 1¾", accuracy: 1%.

RANGES

Number	Milli-amps	Am-peres	Milli-volts	Volts	Price
Style 1	....	0-3 0-30	0-90	0-3 0-30	$17.50

Other combinations of ranges can be supplied provided individual ranges are multiples of each other, so the scale can be easily read. Current scales can be as low as 15 M.A. and as high as 50 amps.; voltage scales between 90 M.V. and 300 volts. Prices will be furnished on request.

PORTABLE VOLT-METERS AND AMMETERS

NO. 515 FOR DIRECT CURRENT
NO. 517 FOR ALTERNATING CURRENT

Hoyt portable voltmeters and ammeters are mounted on **Bakelite** bases 5" x 4". The movements for direct current are of the D'Arsonval type equipped with drop forged magnets carefully hardened and drawn to insure permanence. All pivots turn in sapphire bearings. The scales are hand calibrated. The alternating current meters are built on the repulsion or soft-iron principle. Damping is secured by a vane attached to the movement moving in a partially closed air chamber. Accuracy—1%. Prices on type 515. Direct current Voltmeters and Ammeters range from $15.00 to $25.00; while on Type 517 alternating current meters the prices range from $18.00 to $27.50.

Type 562 represents an excellent meter for individual student use in either D.C. or A.C. at a very reasonable price.

The instrument can be furnished as a voltmeter or as an ammeter in single or double ranges to meet individual school requirements.

Prices:

Single ranges ...	$ 9.00
Double ranges less than 100 volts	9.50
Double ranges over 100 volts	10.00

MINIATURE GALVANOMETERS

TYPE 510-M

This instrument is mounted on a 45 degree angle block for ease in reading from any position. It is equipped with a large magnet and sensitive moving system but ruggedly built for individual student use.

Scale: 30-0-30 Divisions

Sensitivity: 23 Microamperes will move the pointer one scale division.

Resistance: 30 ohms

Price: $12.50

LABORATORY CONSTRUCTION COMPANY

1113-1115 Holmes Street

Kansas City, Mo., U. S. A.

"Better Laboratory Equipment" for Schools

"Better Laboratory Equipment" has been designed primarily for efficient operation, cleanliness, and durability of construction and materials. No small factor in getting the desired results from a school laboratory is the **equipment.** We shall be glad to send to any school executive our illustrated booklet entitled "Better Laboratory Equipment," in which are described Kjeldahl Distillation and Digestion Apparatus, Laboratory Equipment Tables, Acid Dispensing Stands, Electric Heating Units, Electric Grinders and Flask Carriers.

The KJELDAHL Digestion Unit

Internal Self-Draining Fume Tube with Air Ejector (patented)

Does Not Require a Hood

Below is illustrated a separate Kjeldahl Digestion Unit, 24-flask capacity, electrically equipped with master switch and pilot light; overall dimensions 2'0" x 11'2".

The fume tube on this unit features the internal drain sockets which confine the acid condensation inside the tube. Proper drains are provided to care for the condensation from the fume tube, ejector and stack. This eliminates the drip on table tops and floor or the need of placing an open drain under the battery of sockets. Cleanliness is thereby assured, and internal drainage is obtained throughout the fume tube and stack.

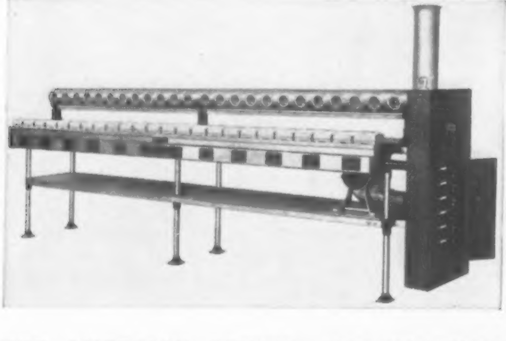
This unit is made of heavy chemical lead properly reinforced and designed—a practical, proved material for this specific use. The special sockets reduce breakage of flasks to a minimum because the design provides for easy, safe contact. **See booklet for further details.**

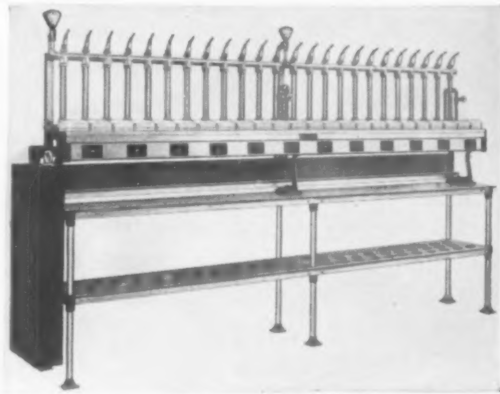
The KJELDAHL Distillation Unit

All-Brass Thermo-Siphon Pressure Condensers with Thermometer and Hand or Automatic Valve Control (patent pending)

(Illustration above)

The condensers of the Kjeldahl Distillation Unit feature the manifold and water jacket tubes.





The tube farthest away from the fresh water intake operates the same as the one closest to it. The flow of water can be regulated to maintain cold water in contact with the receiving tubes. Each single condenser is operated in a battery of twelve at the same temperature. A thermometer and control valve for water supply permits each battery of twelve condensers to be maintained at a temperature that has been predetermined for the highest efficiency.

Our construction eliminates many connections and permits a uniform area of water circulation. Air pockets and stagnation in circulation are practically impossible. Constant circulation is provided at all times by forced circulation operating under the thermo-siphon principle with controlled back pressure. With this system maximum condensation is obtained with minimum water pressure. **See booklet for further details.**

Laboratory Equipment Tables

Equipment and Work Tables are constructed with a thought for convenience; designed with the necessary shelves and brackets to facilitate work; durable and serviceable; all types; any required size.

Goldfisch Electric Heaters

These durable heaters of high efficiency are made in two designs: Type 50 Digestion Heater designed for round bottom flasks 500 cc. to 800 cc. with top formed for perfect flask contact when the flask is used on an angle; and Type 60 Distillation Heater designed for round bottom flasks 800 cc. to 1000 cc. with top formed for use of flask in vertical position.

Write for Booklet, "Better Laboratory Equipment."

THE MATHESON CO.

North Bergen, New Jersey

Gas Department

THE LECTURE BOTTLE

For Universities, Colleges, High Schools and Individuals

Interchangeable in twenty-four gases—shipped on day order received.

On account of its convenience it has become Standard Laboratory equipment. It does not need a regulator—its valve being delicate enough to permit close adjustment without one. Ask for Bulletin III.

ABSORPTION SPREADER

Write Department A, for a folder describing this Absorption Spreader.

LABORATORY AUTOMATIC REDUCING REGULATORS

Needle Valve Outlet and Hose Connection, also supplied with single gauge.

For Oxygen, Hydrogen, Nitrogen, Carbon Dioxide, Argon, Helium, Nitrous Oxide and other gases. Close register on low working pressures. Ask for Bulletin IV.

Apparatus Department

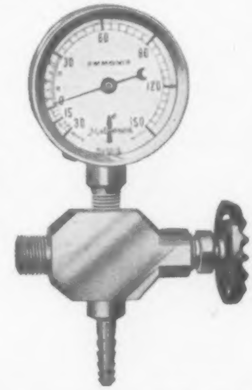
GASOMETER EQUIPMENT FOR LIQUID HYDROGEN SULFIDE SUPPLY

For classroom use ask for Bulletin I.

For individual use see Bulletins II and III.

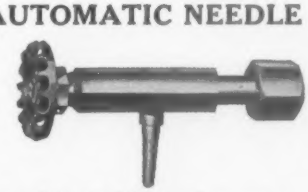
GASOMETERS are now the accepted form of sulfuretted Hydrogen supply. Available in 5 sizes of cylinders.

AMMONIA REGULATOR (Non-Automatic)



Permits quick and easy adjustment of flow to less than one bubble per second up to full flow.
Ask for Bulletin IV.

NON-AUTOMATIC NEEDLE VALVE



For use with all kinds of gases.
Permits quick and easy regulation for use where a Gasometer is not desirable.

RUBBER TUBING

We carry in stock a large supply of rubber tubing in six sizes, 2 weights and three colors. This tubing is specially prepared for use with laboratory gases.

LEONARD PETERSON & CO., INC.

Manufacturers of

Laboratory, Home Economics
Vocational and Library Furniture

1222-1234 Fullerton Avenue, Chicago, Ill.

We manufacture various designs of tables, desks, hoods, cases and cabinets for Chemistry, Physics, Biology and General Science; tables, sinks and cabinets for Domestic Science; tables, desks and other equipment for Sewing, Bookkeeping, Typewriting, Mechanical Drawing and Art—also Manual Training Benches, Lunch Room Tables and Counters, Office Desks, Tables and Chairs and a complete line of Library furniture.

Building equipment of this kind has been our sole business for more than 38 years. We are pioneers in the industry. Our equipment is all for this kind of furniture. This specialization has made experts of our men. Each job with its little individual problem to solve makes it just that much easier for us to solve the problems on the next job. Thus our organization has become masters in the art.

Peterson furniture is built with the latest features and the price is within reach of those who demand furniture of lasting quality.

MORE THAN 500 STANDARD DESIGNS ARE DESCRIBED IN OUR CATALOG NO. 16-M, A COPY OF WHICH WILL BE SENT ON REQUEST

SPENCER LENS COMPANY

Manufacturers of

MICROSCOPES—MICROTOMES—DELINEASCOPES

Buffalo, New York

BRANCHES

New York Chicago Boston San Francisco Washington Minneapolis Los Angeles

SPENCER BUFFALO U.S.A.

SPENCER MICROSCOPES FOR HIGH SCHOOL AND COLLEGE USE

The Spencer Lens Company have been pioneers in microscope-building, the first Spencer microscopes being made more than 75 years ago. They were the first to build apochromatic objectives; the first, and for a dozen years the only, manufacturer in America to build microscopes with side fine-adjustments; the originators of the attachable mechanical stage that clamps on the side of a microscope; the originators and only builders of fork-type substages, converging tube binocular microscopes, combination binocular and monocular body all in one, combination substage condenser and dark-field illuminator. In short, most of the improvements in microscope construction during recent years have originated in our factory.

Most laboratory workers prefer Spencer microscopes not merely because the Spencer Company were pioneers, but because they have continued to pioneer all down through the years up to the present day.

SPENCER NOS. 55 AND 56

SPENCER NOS. 55 AND 56

These exceptionally large instruments meet in a most satisfactory way the demand for a large stage. The plate glass stage is 100 mm. x 100 mm. Objects in the center of a dish 50 mm. high and 130 mm. in diameter may be brought into the lines of vision. (Illustrated above.)

SPENCER NO. 44-MH

SPENCER NO. 44-MH

This laboratory microscope has been designed for those who prefer a square stage microscope, yet want a real mechanical stage permanently attached, having sufficient range of motion to completely cover the usual 3" x 1" microscope slide. It is an ideal instrument for the medical student's use.

SPENCER NO. 64

Microscope No. 64 with side-fine adjustment, lever type, is an ideal instrument for high school or college use where simplicity and durability are paramount considerations. It is easy to use, rugged in design, and has a superior type of fine adjustment, with 34 threads of the screw engaged instead of the usual one or two.

SPENCER NO. 64

THE STANDARD ELECTRIC TIME COMPANY

Springfield, Mass.

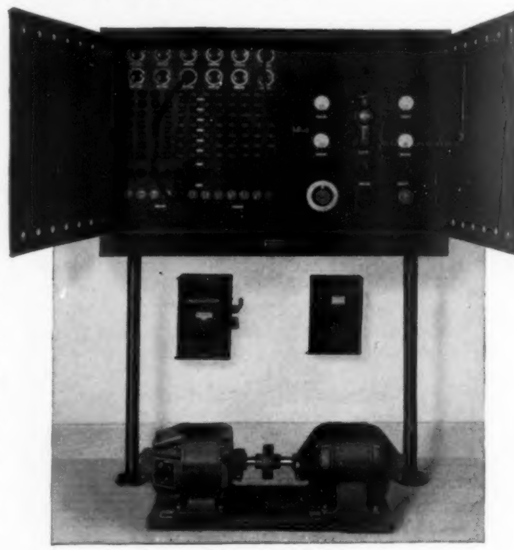
The Standard Electric Time Co. of Canada, Ltd., 726 St. Felix St., Montreal, P. Q.

ATLANTA, 204 Glenn Bldg.
BALTIMORE, 2 E. Redwood St.
BIRMINGHAM, 2920—7th Ave., So.
BOSTON, 10 High St.
BUFFALO, Stock Exchange Bldg.
CHARLOTTE, N. C., 217 Latta Arcade
CHICAGO, 1510 Monadnock Bldg.
CLEVELAND, 1333 Union Trust Bldg.
COLUMBUS, O., 83 South High St.
DALLAS, 716 Mercantile Bank Bldg.
DENVER, 562 Pennsylvania St.
DETROIT, 806 Donovan Bldg.
KANSAS CITY, MO., Mutual Bldg.
LOS ANGELES, Room 670, 124 W. 4th St.
MINNEAPOLIS, 745 McKnight Bldg.
NEW YORK CITY, 50 Church St.
PHILADELPHIA, 1612 Market St.
PITTSBURGH, Bessemer Bldg.
PORTLAND, ORE., 65 First St.
SAN FRANCISCO, 1 Drumm St.
SCRANTON, 148 Adams Ave.
SEATTLE, 918 Western Ave.
SPOKANE, 110 S. Cedar St.
TAMPA, 114 W. Alfred St.

STANDARD LABORATORY EQUIPMENT

General

This equipment consists of current distribution and control panel, motor generator and storage battery. The apparatus is used in physics, chemistry, biology and electrical laboratories, and any other places where electricity is desired for experimental purposes.



Panel

The experimental board consists of a jack panel and a control panel. The jack panel is furnished with a double pole receptacle for the termination of each table circuit, also current supply jacks for low and high voltages D.C. and A.C. The arrangement is such that all table circuits may be furnished with the same or different voltages simultaneously. This is accomplished by plugging flexible connectors from current supply jacks into the table circuit jacks.

The control panel contains all necessary voltmeters, ammeters, switches, transformer, rheostats, etc., for the control of the motor generator and charging of storage battery. The cut shows a 12-table circuit panel.

Motor Generator

The motor generator is furnished usually to supply from 80 to 115 v. D.C. where this is not otherwise available in the building. The size and type of machine depends entirely upon needs of the institution.

Storage Battery

Storage batteries of various capacities and number of cells are furnished to give the range of low D.C. voltages. Taps are taken off the battery at various points and connected to the battery jacks on panel.

Flexibility

This equipment has a great flexibility of use in that various groups of students may work on different experiments requiring different currents at the same time. The apparatus appeals to all people who teach electricity. Panels are designed and built to meet the particular requirements of the school in which they are installed as well as to conform fully to underwriters' requirements.

We are always glad to make suggestive layouts and submit prices covering special needs.

Ask for literature or our representative to call.

See pages 134 and 135 for electric clock and fire alarm systems.

THE THERMAL SYNDICATE, LTD.

1720 Atlantic Avenue, Brooklyn, New York

VITREOSIL LABORATORY WARE

(Fused Pure Silica) **(Fused Pure Quartz)**

There is a shape and kind of Vitreosil for every purpose and the highest order of work assumes its use. Yet Vitreosil, giving a greater period of usefulness, is not expensive in the long run, and in cases where it serves as a reliable substitute for platinum, it is much lower in initial cost.

The properties of Vitreosil laboratory ware are such as to include a wide range and ever increasing scope of usefulness to the chemist, physicist, metallurgist, and those engaged in the allied sciences.

USE VITREOSIL

When you desire a material having the lowest thermal expansion or the least soluble of any known substance.

When absolute resistance to corrosive gases and liquids is essential.

When good electrical insulation is required even at a bright red heat.

When transparency to the spectrum is required in the infra-red region as well as in the ultra-violet down to 2000 Ångstrom units and in the intermediate spectrum.

When a non-porous material is necessary at high temperatures.

When you require utensils that will remain constant in weight throughout your investigations.

ESPECIAL ATTENTION IS DRAWN TO THE FOLLOWING NEW DEVELOPMENTS:

Transparent Vitreosil crucibles with ground-in capsule or crucible covers for the determination of volatile and combustible matter in coal and coke respectively. (See illustration.)

Muffle trays to accommodate the above crucibles in all sizes suggested by the A.S.T.M. and for standard Vitreosil crucibles.

Special shapes to accurate specifications for electrical insulation.

Transparent Vitreosil plate of unusually heavy thickness for blocks, prisms, lenses, etc.

Transparent Vitreosil coefficient of expansion apparatus. This is an inexpensive arrangement giving an accuracy of better than 2% in the value of the coefficient for ordinary materials.

Obtainable through all dealers or direct from us.

SPECIAL QUANTITY DISCOUNTS TO UNIVERSITIES

Write for Literature

THE U. S. STONEWARE CO.

Works (Since 1865), AKRON, OHIO

New York Office: 50 Church Street

ACID-PROOF CHEMICAL STONEWARE LABORATORY SINKS

"U. S. STANDARD" Chemical Stoneware Laboratory Sinks are widely used in Chemical, Physical and Bacteriological Laboratories of Universities, High Schools and Hospitals. These Sinks offer the following overwhelming advantages:

1. They are of one-piece construction, made without seams, slabs or interlocking joints, and are thus permanently leak-proof and trouble-proof.
2. The material is non-porous and non-absorbent. It does not become slimy; does not peel, chip, or disintegrate.
3. These sinks can be kept clean very easily. With rounded inside corners and smooth salt glaze, they can always be kept immaculate.
4. The body is of a uniform and homogeneous texture throughout. Each sink is unconditionally guaranteed to give full and complete satisfaction in every respect and to be acid-proof, chemical-proof and corrosion-proof throughout the stoneware body, with or without the salt glaze.
5. The salt glaze will not crack nor craize.
6. These sinks are everlasting and permanent because they are incorrodible.
7. The cost is no greater than for natural stone, enameled or china sinks.

Special sizes and styles can always be made up. Sample pieces will be gladly furnished for comparative analytical and physical tests.

Write for Bulletin No. 512 giving complete list of standard stock sizes and prices.

OTHER ACID-PROOF PRODUCTS FOR LABORATORY USE

Suction Filters	Acid Pitchers
Buechner Funnels	Drain Boards
Distilled Water Tanks	Gas Generators
Acid Jars	Electrolytic Chlorine Cells (Laboratory Size)
Mariotte Bottles	Electric Churn Mixers
Evaporating Dishes	Slop Jars
Boiling Kettles	

ACID-PROOF PIPING FOR ACID WASTE AND VENTILATING LINES

Our Acid-Proof Chemical Stoneware Piping is the ideal material for Acid Waste and Ventilating Lines. There is no other commercial product which is as universally resistant to acids, alkalies and corrosive chemicals and gases.

Bromine, ferric chloride, sulphuric, sulphurous, nitric and hydrochloric acids of any concentration or temperature, can all be handled with perfect safety. "U. S. STANDARD" Chemical Stoneware Piping is free from all the limitations of brass, rubber, cast iron, lead and high silicon irons. There is no hazard, no upkeep, no leaks and no repairs.

An installation of our Chemical Stoneware Piping is very easily and conveniently handled. The first cost is decidedly lower. A growing list of Architects, Engineers, Testing Laboratories and Municipal Plumbing Boards, has placed its stamp of approval upon "U. S. STANDARD" Acid-Proof Chemical Stoneware.

FIG. 112-A
Laboratory Sink (Plain Countersunk Outlet)

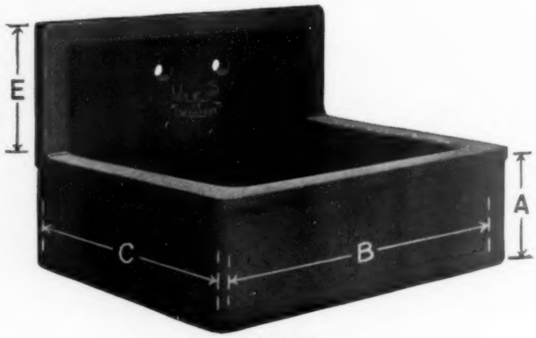


FIG. 112-ASP
Laboratory Sink (With Integral Back)

W. M. WELCH MANUFACTURING COMPANY

MANUFACTURERS OF LABORATORY, VOCATIONAL AND LIBRARY FURNITURE

Laboratory and Library Furniture Factory
MANITOWOC, WISCONSIN

General Offices and Warehouse
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LABORATORY * VOCATIONAL * LIBRARY FURNITURE for SCHOOLS and COLLEGES

FURNITURE of STANDARD AND SPECIAL DESIGN for Chemistry, Physics, Biology, General Science, Agriculture, Sewing, Domestic Science, Mechanical Drawing, Art, Manual Training, Commercial and Library, for schools and colleges.

Complete Catalog "F" and engineering data covering our complete line of laboratory, vocational and library furniture furnished architects and buyers upon request.

RECENT INSTALLATION, EASTERN HIGH SCHOOL, LANSING, MICHIGAN

NO. 2100 CHEMISTRY DESK

NO. 6000 INSTRUCTOR'S DESK

The personnel of the W. M. WELCH MANUFACTURING COMPANY is composed of experienced and specially trained representatives, who are prepared to assist architects in the selection and design of standard and specially designed laboratory, vocational and library furniture.

Our engineering and designing department, composed of experienced laboratory furniture engineers, who devote their entire time to this type of work, is at your service at all time, without charge or obligation. The service of this department includes the preparing of suggestive floor plan layouts, showing the location of each piece of equipment with the dimensioned locations of the roughing-in risers for all piping for drainage, gas, compressed air, vacuum, hot and cold water, distilled water, alternating and direct current electricity, steam and mechanical ventilation for chemical hoods, or other possible services that may be required.

Send your plans in to us for our suggestive survey, which is offered to you without incurring any obligation whatsoever.

WESTON ELECTRICAL INSTRUMENT CORP.

601 Frelinghuysen Avenue, Newark, N. J.

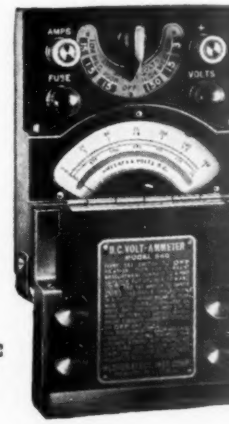
ENGINEERING AND SALES OFFICES

Albany	Cleveland	Knoxville	Pittsburgh	Seattle
Atlanta	Dallas	Los Angeles	Portland	Spokane
Boston	Denver	Minneapolis	Rochester	Syracuse
Buffalo	Detroit	New Orleans	St. Louis	Tacoma
Chicago	Houston	New York	San Antonio	Tampa
Cincinnati	Jacksonville	Philadelphia	San Francisco	

The World's Scientific Standards

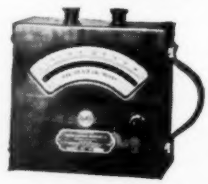
Wherever electrical tests are made, there is no single measurement which does not derive its authenticity from an original Weston discovery or invention. The use of Weston instruments in schools and scientific laboratories has become as thoroughly established as the art of measurement itself. It is a fixed principle that only "Westons" should be used in the study of electricity, just as Ohm's Law is a fundamental part of the student's educational groundwork. Only the most exacting standards of craftsmanship and accuracy should be offered the student as examples of the precise work which makes for progress and success in the professional and scientific field. And that means "Westons"—the electrical measurement standards of the world. Following are a few of the many hundreds of models shown in the Weston catalog—these being particularly recommended for school equipment.

MODEL 540, PORTABLE D. C. VOLT-AMMETERS

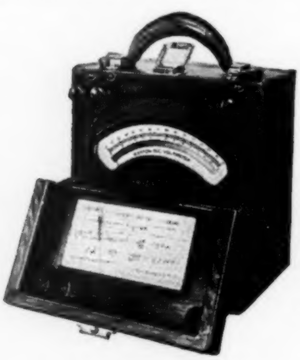


Solid bakelite case, compact and durable. Provided with mirror scales, and quick range-changing device. Especially designed for student's use. A precision type instrument of pocket size, reasonably priced.

MODEL 155, PORTABLE A. C. AMMETERS AND VOLTMETERS



For general alternating current testing. Movable iron type. Accuracy, within ½ of one per cent. For use on commercial frequencies. Can also be used for direct current testing.



MODEL 45, PORTABLE D. C. AMMETERS AND VOLTMETERS

Permanent magnet movable coil type instruments for general testing. Shielded from the effects of external magnetic fields. Accuracy, within ½ of one per cent.

MINIATURE PORTABLE A. C. TEST SETS

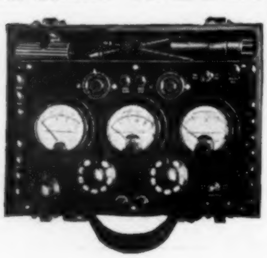
Handy, compact, light-weight instruments enclosed in durable bakelite cases, furnished with leather carrying case. Model 539 Current Transformer; Model 528 One-Ampere Ammeter; Model 528 Voltmeter. Testing range from 0.2 to 200 amperes. Voltmeters can be supplied in various combinations of voltages. All instruments can be ordered singly, if preferred.

OTHER WESTON PRODUCTS

The Weston line covers every field of electrical testing. Write for your copy of the 1930 Catalog containing descriptive information and prices with reference to hundreds of models and many thousand range combinations.

MODEL 547, RADIO SET TESTER

A remarkably complete instrument, considered by radio dealers and professional service men as an indispensable aid in locating and correcting set troubles. For A. C. and D. C. Easy to operate, makes all the required tests. Complete with instruction book. Ideal for student's use.



Section XI

CHEMICAL INDEX

The following index lists the chemicals currently used in the laboratory and research work of schools and colleges, together with the names of some of the principal suppliers. Addresses and additional information will be found on pages 555–569.

The grades in which the manufacturers state that they are prepared to furnish their chemicals have been classified as follows:

1 — *Manufacturer's highest grade of reagent chemicals (C. P. grade).*
2 — *A grade suitable for most laboratory uses, although below C. P. quality (U. S. P. grade).*
3 — *A good commercial quality (Technical grade).*

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.°	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Acacia (Gum Arabic)	1	....	....	....	....	....	....	....
Acetaldehyde	....	1–2	....	....	....	1	1	....
Acetamide	2	1–2	....	....	1	1	1	....
Acetanilide (Antifebrin)	2	1	....	....	2	....	1	....
Acetic Anhydride	1–2–3	1–2	1	3	1*–1	1	1	....
Acetone	1–2	1–2	1–2–3	....	1*–1	....	1	....
Acetphenetidin (Phenacetin)	1	1	....	....	2	....	....	....
Acetyl Chloride	....	2	1–2	....	2	....	1	....
Acid Acetic, Glacial 99.5%	1–2	1–2	1–2–3	1–2–3	1*–1	....	1–2	....
Acetic Glacial Conf. to Dichromate Test	1	....	1	....	1*	....	1	....
Acetic, Spec. for Shellac Anal	1	....	1	....	....	....	....	....
Acetic 36%	2	....	2	2–3	1*–1–2	....	1–2	....
Arsenic H_3AsO_4	....	....	1	3	1	1	....	....
Acetylsalicylic (Aspirin)	2	1	....	....	2	....	....	....
Anthranilic	....	1	....	....	....	....	....	....
Arsenic	1–2	....	1	....	2	1–2	1	....
Arsenious	1–2–3	....	1	....	1*–1	1–2–3	1	....
Benzoic	1–2	1	....	....	1*–1	....	1	....
Boric, Cryst. & Po.	2	2	....	....	1*–1	1	1	....
Boric, Cryst	1	....	1	....	1*	1	1	....
Boric, Anhyd	....	....	....	....	1*	1	1	....
Butyric	1	1–2	....	....	2	....	1	....
Carbolic, Cryst	1–2	1	1–2	3	1*–1	....	1	....
Carbolic, Liquid	2	....	....	3	2	....	1	....
Chloroacetic (Di-Mono-Tri-)	....	1	....	....	....	1	1	....
Chloroplatinic	1	....	1	....	2	....	1	....
Chromic	1–2–3	....	1–2	3	1*–1	1	1	....
Cinnamic	....	1	....	....	2	....	....	....
Citric, Cryst	1	1	1	....	....	....	1	....
Citric, Cryst. & Po	1–2	....	....	....	1*–1–2	....	1	....
Formic, About 85%	1–2–3	2	(90 & 50%) 1	3	1	1	1	....
Gallic	1	1	....	....	1*–2	....	1	....
Glycerophosphoric	....	....	....	....	2	....	....	....
Hippuric	....	1	....	....	3	1	....	....
Hydriodic	2	1	....	....	1*–2	....	1	....
Hydrobromic 40%	....	2	(42%) 1	....	1*–1	1	1	....
Hydrobromic 34%	1–2	....	....	....	2	1	....	....
Hydrochloric (Muriatic)	3	....	1–2–3	1–2–3	2–3	....	3	....
Hydrochloric Sp. Gr. 1.18–1.19	1	....	1	1	1*–1–2	....	1–2	....
Hydrochloric fr. fr. Arsenic	1	....	1	1	1*	....	1	....
Hydrocyanic	....	....	....	....	2	....	....	....
Hydrofluoric 52–55%	1–3	....	3	3	2	....	2–3	....
Hydrofluoric 48%	3	....	1–3	3	1*–1	....	1–2–3	....
Hydrofluoric 52% & 60% & Etching Acid	....	....	2	3	....	....	....	....
Hydrofluorsilic, 27–30%	1	....	1	....	1	....	1–3	....
Hydrophosphorous	....	....	....	....	2	....	....	....
Hypophosphorous	1–2	....	....	....	2	1–2	....	....
Iodic, Cryst	1	....	1	....	1	....	1	....
Iodic, Anhydr	1	....	....	....	2	....	1	....

† C. P. Baker's Analyzed Chemicals are indicated as No. 1. Baker's Purified with Analysis as No. 2.
° Eastman Grade No. 1 is specified on the basis of boiling, melting or decomposition temperatures.
§ The General Chemical Co. have used No. 1 to indicate their Baker & Adamson Reagent Quality and No. 2 the Baker & Adamson Fine Chemicals.
* Merck & Co., Inc.'s "Blue Label Reagents."

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Acid Lactic, 85%	1-2	2	1	1-3	1*-1-2	2	1	....
Malic	....	1	....	....	2	....	....	....
Malonic	....	1	....	....	....	....	....	....
Molybdic, 85%	1-2	....	1	....	1*-1	1	1	....
Molybdic, Anhydr., 99.5-100%	1	....	1	....	1*-1	1	1	....
Monochloracetic	1	1	....	....	1	1	1	....
Nitric, Sp. Gr. 1.42	1	....	1-3	1-3	1*-1-2	....	1-3	....
Nitric, Fuming	1	....	1	3	1	....	1	....
Nucleic	....	1	....	....	3	....	....	....
Oleic	2	2	2	....	2	1	....	....
Osmic	....	1	....	....	2	....	....	....
Oxalic, Cryst	1-2	1	1-2	3	1*-1-2	1	1	....
Perchloric 60%	1	1	....	....	1	1	1	....
Perchloric 20%	1	....	1	....	1	1	1	....
Phosphomolybdic	1	....	....	....	1	1-2	1	....
Phosphoric, 85%	1-2	....	1-2	3	1*-1-2	1-2	1	....
Phosphoric (Glacial) Meta Sticks	1	....	....	....	1*-1	1	1	....
Phosphoric, Anhydr	1	....	1	....	1*-1	1	1	....
Phosphorous C. P. Cryst	....	....	1	....	....	1	....	....
Phosphotungstic, Cryst	1-2	....	....	....	1	1-2	1	....
Phthalic, Anhydr	1-2	1	....	....	1	....	1	....
Picric	1	1-2	1	....	1-2	....	1	....
Picramic	1	1	....	....	....	....	....	....
Propionic	....	1	....	....	....	....	1	....
Pyrogallic	1-2	1	1	....	1-2	....	1	....
Pyroligneous	2	....	....	....	2	....	....	....
Rosolic	1	1	....	....	1*	....	....	....
Salicylic	1-2	1	1	....	1-2	....	1	....
Selenic and Selenious	....	....	....	....	....	....	1	....
Silicic	1	....	....	....	1	1	1	....
Silicotungstic	1	....	....	....	1	1	1	....
Stearic	2	1-2	1	....	2	1	1	....
Succinic	1-2	1	....	....	1	1-2-3	1	....
Sulphanilic	1-2	1	1	....	1	....	1	....
Sulphosalicylic	....	1	....	....	1	....	....	....
Sulphuric	1-2-3	....	1-3	1-3	1*-1-2	....	1	....
Sulphurous	1	....	1	....	1	....	1	....
Tannic	1-2	1	1	3	1-2	....	1	....
Tartaric, Cryst	1	1	1	....	1*-1-2	....	1	....
Tartaric, Po	1-2	....	1	....	1-2	....	1	....
Trichloracetic	1-2	1	....	....	1	1	1	....
Tungstic	2	....	....	....	2	1	1	....
Valeric	....	1	....	....	2	1	....	....
Aconitine	....	....	....	....	2	....	....	....
Adeps Lanae	....	....	....	....	2	2-3	....	....
Agar-Agar	2	1	....	....	1*-2	....	1	....
Agaricin	....	....	....	....	2	....	....	....
Albumin, Egg	1	....	....	....	2	....	....	....
Alcohol, Amyl	1-2	1	1	....	1*-1	1	1	....
Benzyl	....	1	....	....	1	1	....	....
Butyl	....	1-2	....	....	....	....	....	....
Capryl	....	1	....	....	....	....	....	....
Ethyl, Absolute, 99.8-100%	1	....	....	....	....	....	....	....
Iso-Butyl	....	1	....	....	....	....	....	....
Isopropyl	....	1	....	....	....	....	....	....
Methyl, 95%	1-(97%)	1	2	....	2	....	1-2	....
Methyl, Absolute Acetone Free	1	1	1	....	1*-1	....	1	....
Alizarine Paste	....	3	....	....	2	....	....	....
Alloys, Devardas, for Reductions	....	....	1	....	1*	....	1	....
Aloin	2	....	....	....	2	....	....	....
Alpha-Naphthylamine	....	1-2	....	....	2	....	1	....
Alum, Ammonium	1-2	....	1-2-3	2-3	1-2	1	1	....
Ammonium Chrome	2-3	....	1	2-3	2	....	1	....
Ammonium Potash	....	....	....	2-3	1-2-3	1	1	....
Potash Chrome	....	....	....	....	2	1	1	....
Aluminum (Metal)	1	....	1	....	2	....	1	....
Acetate	1-2	....	1	....	1	1-2	1	....
Chloride, Hydrated	....	....	1	3	1	1	1	....
Chloride, Anhydrous	1	....	1	....	1	1	1	....
Fluoride	1	....	1	....	1	1	1	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Aluminum Hydroxide	1	....	1	....	1	1	1	....
Nitrate	1-2	....	1	....	1	1-2	1	....
Oxide, Ignited	1-2	....	1	....	1	1	1	....
Phosphate	1	....	....	....	1	1	1	....
Potassium Sulphate	1-2	....	1-2-3	....	1-2	1	1	....
Sodium Sulphate	1-2	....	....	....	2	1	1	....
Sulphate	1-2-3	....	1-2-3	3	1-2	1	1	....
Aluminum & Ammonium Sulphate, Cryst	1	....	1-2	3	1-2	1	1	....
Aluminum & Potassium Sulphate, Cryst	1	....	1-2	....	1-2	1	1	....
Amidopyrine	....	....	....	....	2	....	....	....
Ammonia, Anhydr	....	....	....	....	....	....	....	....
Ammonia Water 28%	3	....	3	3	1*-1-2	....	1-2-3	....
Ammonium Acetate	2	2	1	....	1*-1	1	1	....
Arsenate	1	....	....	....	....	1	1	....
Benzoate	2	1	....	....	2	....	1	....
Bicarbonate	1-2	....	....	....	2	1	1	....
Bichromate	1-2-3	....	1	....	1-2	1-2-3	1	....
Bifluoride	2	....	....	....	2	1-3	1	....
Bisulphate	1	....	....	....	1	1	1	....
Bisulphite	1	....	1	....	2	....	1	....
Bitartrate	1	....	....	....	2	1	1	....
Borate	1-2	....	....	....	2	1	1	....
Bromide	1-2	....	1	....	1-2	....	1	....
Carbonate, Cubes	1	....	1	....	1-2	....	1	....
Carbonate, Lumps	1	....	1	....	1*-1-2	1	1	....
Chloride, Gran	1	....	1-2	3	1*-1-2	1	1	....
Chromate	1-2	....	....	....	1	1	1	....
Citrate	1-2	....	....	....	1	....	1	....
Dichromate	2-3	....	....	....	1-2	1-2-3	1	....
Fluoride	1-2	....	1	....	1	1	1	....
Formate	1	....	1	....	1	1	1	....
Hypophosphite	....	....	....	....	2	2	1	....
Hydroxide	1-2-3	....	1-2	1-3	1*-1-2	....	1	....
Iodide	1-2	....	....	....	2	....	1	....
Molybdate	1-2	....	1	....	1*-1-2	1	1	....
Nitrate	1-2-3	....	1-2-3	....	1*-1-2	1	1	....
Oxalate	1-2	....	1-2	....	1*-1	1-3	1	....
Persulphate	1-2	....	1-2	....	1*-1-3	....	1	....
Phosphate Monobasic	1-2-3	....	1	....	1	1	1	....
Phosphate Dibasic	1-2-3	....	1	2-3	1*-1	1	1	....
Phospho-Molybdate	1	....	....	....	2	1	1	....
Salicylate	2	....	....	....	2	....	1	....
Sulphate	1-2-3	....	1-2-3	3	1*-1	1	1	....
Sulphocyanate	....	....	1	....	1*-1	1-3	1	....
Sulphide Solution	1	....	1-2	3	1-3	....	1	....
Tartrate	1-2	....	1	....	1	1	1	....
Valerate	....	....	....	....	2	....	....	....
Amygdalin	....	....	....	....	2	....	....	....
Amyl Acetate	2	1-3	....	....	2	....	1	....
Alcohol	....	1	1	....	1	1	1	....
Butyrate	....	1-3	....	....	2	....	....	....
Nitrate	....	1	....	....	2	....	....	....
Salicylate	....	1	....	....	2	....	....	....
Valerate	....	3	....	....	2	....	....	....
Analytical Chemicals	1-2-3	1	1-2-3	....	1-2-3	1-2-3	1	....
Anethol	....	1	....	....	2	....	....	....
Aniline	....	1-2	1	....	1-3	....	1	....
Hydrochloride	1-2	1	1	....	....	....	1	....
Sulphate	....	1	....	....	2	....	1	....
Anthracene	1	1-3	....	....	....	....	1	....
Anthraquinone	....	1	....	....	....	....	....	....
Antimony, Metal	1	....	1	....	2	1-3	1	....
Chloride	1	....	....	....	1	1	1	....
Oxide	1	....	1	....	1-2	1	1	....
Potassium Tartrate	1-2	....	1	....	2	1	1	....
Sulphate	1	....	1	....	....	1	1	....
Antipyrine	....	....	....	....	2	....	....	....
Apomorphine-Hydrochloride	....	....	....	....	2	....	....	....
Arbutin	....	....	....	....	2	....	....	....
Arabinose	....	1	....	....	2	....	....	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Arecoline Hydrobromide	....	....	....	....	....	....	....	....
Arsenic, Metal	1	....	1	....	2	2	1	....
Bromide	....	....	....	....	2	1	1	....
Sulphide	1	....	....	....	2	1-3	1	....
Trioxide	1-2-3	....	1	....	1*-1-2	1-2-3	1	....
Arsphenamine	....	....	....	....	2	....	....	....
Asbestos	1	....	1	....	....	....	1	....
Asparagin, Pure	....	....	....	....	2	....	....	....
Atropine and Salts	....	....	....	....	2	....	....	....
Azolitmin	....	....	....	....	1*	....	....	....
Balsam, Fir, Canada	1	....	....	....	....	....	....	....
Peru	....	....	....	....	2	....	....	....
Barium Acetate	1-2	....	1	....	1	1-2	1	....
Bromate	....	....	....	....	....	1	1	....
Bromide	....	....	....	....	2	1	1	....
Carbonate	1-2-3	....	1	3	1*-1	1	1	....
Chlorate, Cryst	2	....	1	....	1	1	1	....
Chloride, Cryst	1-2-3	....	1-2-3	3	1*-1	1	1	....
Chromate	1	....	....	....	2	1	1	....
Dioxide	1-2	....	1	....	1	1	1	....
Fluoride	1	....	1	....	1	1	1	....
Hydroxide, Cryst	1-2-3	....	1	....	1*-1-2	1	1	....
Hydroxide, Dried	1-2	....	....	....	1	1	1	....
Nitrate, Cryst	1-2	....	1	3	1*-1-2	1-2	1	....
Peroxide	1-2	....	....	3	2	1	1	....
Sulphate (not X-ray)	1-2	....	1	3	1-2	1	1	....
Sulphide	2	....	....	....	2	1-2-3	1	....
Sulphite	1	....	....	....	....	1	1	....
Benedict's Qualitative Solution	....	....	....	....	2	....	....	....
Benzaldehyde	2-3	1	....	....	2	2	1	....
Benzene	1-2	1-2	1-2-3	....	1*-1-2	1	1	....
Benzidine	1	1-2	....	....	1*-1	....	....	....
Benzoyl Chloride	1	1	....	....	1-2	....	1	....
Benzyl Alcohol	....	1-2	....	....	1-2	1	....	....
Benzoate	1	1	....	....	2	....	....	....
Chloride	1	1-2	....	....	1-2	....	....	....
Benzin	1	....	....	....	1	....	....	....
Beta-Naphthyl	2	1-3	1	....	2	....	1	....
Beta-Naphthyl Benzoate	....	1	....	....	2	....	1	....
Beta-Naphthylamine	....	1-3	....	....	....	....	1	....
Bismuth, Metal	1	....	1	....	1-2	....	1	....
Acetate	1	....	....	....	....	....	1	....
Beta-Naphthol	....	....	....	....	2	....	....	....
Chloride	1-2	....	1	....	1	....	1	....
Citrate	....	....	....	....	2	....	1	....
Nitrate	1-2	....	1	....	1	....	1	....
Oxide, Hydr	1	....	....	....	1	....	....	....
Oxychloride	1-2	....	....	....	1	....	....	....
Subnitrate	1-2	....	1	....	1-2	....	1	....
Subcarbonate	1-2	....	....	....	1-2	....	1	....
Subgallate	2	....	....	....	2	....	1	....
Subsalicylate	....	....	....	....	2	....	....	....
Bleaching Powder	1-2	....	3	3	....	....	1-3	....
Bromine	1-2	....	1	....	1*-1-2	1-2	1	....
Bromphenol Blue	....	1	....	....	....	....	....	....
Bromoform	2	1	....	....	2	....	....	....
Bromthymol Blue	....	1	....	....	....	....	....	....
Brucine	....	....	....	....	2	....	....	....
Butyl Alcohol	....	1-2	....	....	2	....	....	....
Butyl Chloral Hydrate	1	....	....	....	2	....	....	....
Cadmium (Metal)	1	....	1	1-3	2	....	1	....
Acetate	1-2	....	....	....	1	1	1	....
Bromide	1-2	....	....	....	1-2	1	1	....
Carbonate	1-2	....	1	....	1	1	1	....
Chloride	1-2	....	1	....	1*-1-2	1	1	....
Iodide	1	....	....	....	1-2	....	1	....
Nitrate	1-2	....	1	....	1-2	1	1	....
Potassium Iodide	....	....	....	....	....	....	1	....
Sulphate	1-2	....	1	3	1-2	1	1	....
Caffeine	2	1	....	....	2	....	....	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Caffeine Citrated	2	....	....	....	2	....	....	....
Calamine	2	....	....	....	2	....	....	....
Calcium (Metal)	1	....	....	....	2	1	....	....
Acetate	1–2–3	....	1	....	1–2	1–2	1	....
Arsenate	1	....	....	3	3	1	1	....
Arsenite	....	....	....	....	3	1	1	....
Bromide	1–2	....	....	....	1	1	1	....
Carbide	1	....	2	....	....	....	1	....
Carbonate	1–2	....	1–2	....	1*–1–2–3	1	1	....
Chloride, Cryst	1	....	1	3	1	1–2–3	1	....
Chloride, Dry	1–2–3	1	1–2	3	1*–1–2	1–2–3	1	....
Fluoride	1–2	....	1–2	....	1	1	1	....
Formate	1–2	....	....	....	1	1	1	....
Glycerophosphate	1–2	....	....	....	2	....	....	....
Hypochlorite	1–2	....	3	....	....	1	1–3	....
Hypophosphite	1	....	....	....	2	1	1	....
Iodide	1–2	....	....	....	2	....	1	....
Lactate	2	....	1	....	2	1–2	1	....
Lactophosphate	1	....	....	....	2	1–2	....	....
Nitrate	1–2	....	1	....	1	1	1	....
Oxalate	1–2	....	....	....	2	1	1	....
Oxide	2	....	1–2	....	1*–2	1–2	1	....
Phosphate, Primary	1	....	1	....	1–2	1	1	....
Phosphate, Secondary	1–2	....	1	....	1–2	1	1	....
Sulphate	1–2–3	....	....	....	1–3	1–2	1	....
Sulphide	2	....	....	....	2	1–2	1	....
Sulphocarbolate	1	....	....	....	2	....	....	....
Calomel	1–2	....	....	....	1*–1–2	....	1	....
Camphor	2	1	....	....	....	....	1	....
Monobromated	2	1	....	....	2	2	....	....
Carbon	1	....	....	....	....	....	1	....
Decolorizing (Activated Charcoal)	1	1	1	....	2	....	2–3	....
Disulphide	1–2–3	....	1–2–3	....	1*–1–2	....	1	....
Tetrachloride	1–2–3	1–2	1–2–3	....	1*–1–2	....	1	....
Carborundum	1	....	....	....	....	....	3	....
Carmine	....	....	....	....	1*	....	....	....
Casein	3	1	....	3	3	....	....	....
Catechol	....	1	....	....	....	1	....	....
Cerous Oxalate	....	....	....	....	2	2	....	....
Cetyl Alcohol	....	1	....	....	....	....	....	....
Charcoal	1	....	1	....	2	....	1–3	....
Chemicals, Analytical	....	....	1–2	1–3	....	1–2–3	1	....
for Reagent or Laboratory Purposes	....	1	1–2	1–3	1*–1–2	1–2	1	....
Chloral Hydrate	2	1	....	....	2	2	1	....
Chloramine	....	1	....	....	....	....	....	....
Chlorphenol, Red	....	1	....	....	....	....	....	....
Chloroform	1–2	1	1–2	....	1*–1–2	....	1	....
Chlorophyll	....	....	....	....	2	2	....	....
Cholesterol	....	1	....	....	2	1	....	....
Chromium Chloride	1–2	....	1	....	1	1	1	....
Nitrate Solution	1	....	....	....	1–2	1	1	....
Oxide	1	....	....	....	1*	1–3	1	....
Potassium Sulphate, Cryst	1–2–3	....	1–2	....	1*–1–2	1	1	....
Sulphate	1–2	....	1	....	1–2	1	1	....
Trioxide	1–2–3	....	1–2	....	1*–1–2	1	1	....
Cinchona Bark	....	....	....	....	2	....	....	....
Cinchonidine	1	....	....	....	2	....	....	....
Cinchonine	....	1	....	....	2	....	....	....
Cinnamic Aldehyde	....	1	....	....	2	....	....	....
Cobalt (Metal)	1	....	....	....	2	....	1	....
Acetate	1	....	....	....	1	1	1	....
Carbonate	1	....	....	....	2	1	1	....
Chloride	1–2	....	1	....	1	1	1	....
Nitrate	1–2	....	1	....	1*–1	1	1	....
Oxide	1–2	....	1	....	2	1	1	....
Sulphate	1–2	....	....	....	1	1	1	....
Cocaine	....	....	....	....	2	....	....	....
Cochineal	1	....	....	....	....	....	1	....
Codeine	....	....	....	....	2	....	....	....
Colchichine	....	....	....	....	2	....	....	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Collodion	2	....	....	....	1-2	....	....	....
Colloidal Iron	....	....	....	....	2	....	....	....
Commercial Chemicals	1-2-3	....	2-3	3	3	1-2-3	....	....
Congo Red	1	....	....	....	1*	....	1	....
Copper (Metal)	1	....	1	....	2	1	1	....
Acetate	1-2-3	....	1-2	....	1	1	1	....
Ammonium Chloride	1-2	....	1	....	1*-1	1	1	....
Arsenate	1	....	....	....	2	1	1	....
Arsenite	1-2	....	....	....	2	1	1	....
Bromide	1-2	....	1	....	1	1	1	....
Carbonate	1-2-3	....	1	3	1	1	1	....
Chloride	1-2	....	1	....	1*-1	1-2	1	....
& Potassium Chloride	1	....	1	....	1	1	1	....
Iodide	2	....	....	....	2	....	1	....
Nitrate	1-2-3	....	1	....	1-2	1-2	1	....
Oxalate	1-2	....	....	....	2	1	1	....
Oxide, Black Gran	....	....	....	....	1	1	1	....
Oxide, Black Powd	1-2-3	....	1	....	1*-1	1	1	....
Oxide, Red Powd	1-2-3	....	1-2	....	1	1	1	....
Oxide, Wire Form	....	....	1	....	1	1	1	....
Phosphate	1	....	....	....	2	1	1	....
Sulphate, Crys	1-3	....	1-2-3	3	1*-1-2-3	1	1	....
Sulphate, Powd. Anhyd	1-2	....	1	3	1	1-2	1	....
Coumarin	....	1	....	....	2	....	....	....
Creosote (Wood Creosote)	2	....	....	....	2	....	....	....
Carbonate	2	....	....	....	2	....	....	....
Cresol	2	2	....	....	2	....	....	....
Cupferron	....	1	1	....	....	....	1	....
Curcumin	....	1	....	....	....	....	....	....
Daturine and Salts	....	....	....	....	2	....	....	....
Dextrin	3	1-2-3	....	....	1-2	....	1	....
Dextrose, "C. P." Anhyd	1	1-2	1	....	1	....	1	....
Devardas Metal	....	....	1	....	1*	....	1	....
Dichloramine	....	1	....	....	....	....	....	....
Diethyl Phthalate	....	1	....	....	....	....	....	....
Dimethylamine Benzaldehyde	....	1	....	....	....	....	....	....
Dimethylgloxime	2	1	1	....	1*	1	1	....
Dimethylsulphate	2	2	2	....	....	....	1	....
Diphenylamine	2	1-2	1	....	1*	....	1	....
Dipotassium Hydrogen Phosphate	....	....	....	....	1	1	1	....
Dulcit	....	1	....	....	2	....	....	....
Egg, Albumin	....	....	....	....	2	....	1	....
Ergotin	....	....	....	....	2	....	....	....
Eschka's Mixture	....	....	1	....	1*	1	1	....
Eserine	....	....	....	....	2	....	....	....
Ether (Sulphuric Ether)	2	....	2	....	1*-2	....	1	....
U.S.P. for Anaesthesia	2	....	....	....	2	....	2	....
Anhydrous, Distilled over Sodium	1	1	1	....	1*-1	1	1	....
Petroleum (Ligroin)	....	1-2	1-2	....	1-2	....	1-2-3	....
Ethyl Acetate	1-2	1-2	1	....	1-2	....	1	....
Acetoacetate	....	1	....	....	....	....	....	....
Benzoate	....	1	....	....	2	....	1	....
Bromide	2	1	1	....	1	....	1	....
Butyrate	3	1-3	....	....	2	....	....	....
Chloride	....	1	....	....	....	1	....	....
Ethylhydrocupreine	....	....	....	....	2	....	....	....
Ethyl Iodide	2	1	....	....	2	....	....	....
(Iso) Valerate	....	1	....	....	2	....	....	....
Pelargonate	....	1	....	....	....	....	....	....
Propionate	....	1-3	....	....	....	....	....	....
Salicylate	....	1-2	....	....	2	....	....	....
Ethylene Dichloride	....	1	....	....	....	....	....	....
Glycol	....	1	....	....	....	....	....	....
Eucalyptol	....	....	....	....	2	....	....	....
Eugenol	....	1-2	....	....	2	....	....	....
Filter Paper	1	....	1	....	....	....	1	Eaton-Dikeman Co.
Formaldehyde	....	2	2	3	1*-2	....	1	....
Furfural	....	1-2	....	....	2	....	1	....
Galactose	....	1	....	....	2	....	....	....
Gelatin	1	1-2	....	....	....	1-2-3	....	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Galena Crystals	1	....	....	....	....	....	....	
Glass Wool	1	....	1	....	2	1	1	
Glucose, Pure	3	1	....	....	1	....	....	
Glycerin	1–2	1	1	1–3	1*–1–2	....	1	
Gold Bromide	....	....	....	....	2	....	....	
Chloride	2	....	....	....	1*–2	....	....	
& Sodium Chloride	....	....	....	....	2	....	....	
Guaiacol	2	1	....	....	2	....	....	
Carbonate	2	2	....	....	2	....	....	
Gums (All kinds)	1	....	....	....	....	....	....	
Gypsum	1	....	....	....	....	....	....	
Heliotropin	....	1	....	....	2	1	....	
Hematoxylin	....	1	....	....	....	....	....	
Hexamethylenetetramine	....	1	....	....	2	....	....	
Hide, Powder	1	....	....	....	....	....	1	
Histamine (Ergamine Acid Phosphate); Histidine Dichloride	....	1	....	....	....	....	....	
Homotropine	....	....	....	....	2	....	....	
Hydrastine	....	....	....	....	2	....	....	
Sulphate	....	....	....	....	2	....	....	
Hydrazine Sulphate	....	1	....	....	1*–2	....	....	
Hydrogen Ion Indicators	....	1	....	....	....	....	....	
Peroxide 30%	1–2	....	1–2	....	1*–1	....	1	
Sulphide Water	....	....	....	....	2	....	1	
Hydroquinone	....	1	....	....	2	....	....	
Hydroxylamine Hydrochlor de	2	1	....	....	1*	1	....	
Hyoscine (Scopolamine)	....	....	....	....	2	....	....	
Ichthyol	....	....	....	....	2	....	....	
Indicators, Oxidation-Reduction	....	1	....	....	....	....	....	
Indigo, Carmine	1	....	....	....	2	....	....	
Inulin	....	1	....	....	2	....	....	
Iodeosin	....	1	....	....	1*	....	....	
Iodine	1–2	....	1	....	1*–1–2	....	1	
Tincture	....	....	....	....	2	....	....	
Trichloride	....	....	1	....	2	....	1	
Iodoform	2	1	....	....	2	....	....	
Iron (Metal)	....	....	1	....	2	1–2	1–2–3	
Acetate	1	....	....	....	2	1	1	
Albuminate	....	....	....	....	2	....	....	
& Ammonium Citrate	2	....	....	....	2	....	1	
& Ammonium Oxalate	1–2	....	....	....	1–2	1–2	1	
& Ammonium Sulphate	1–2	....	1	....	1*–1	1	1	
Iron by Hydrogen	1	....	1	....	1*–2	1	1	
Chloride	1–2	....	1	3	1*–1–2	1–2	1	
Citrate	2	....	....	....	2	....	1	
Ferrocyanide	....	....	....	....	2	....	....	
Filings	1	....	1	....	2	....	1	
Glycerophosphate	....	....	....	....	2	....	....	
Hypophosphite	2	....	....	....	2	2	....	
Iodide	2	....	....	....	2	....	....	
Nitrate	1	....	1	....	1*–1	1	....	
Oxalate	1–2	....	....	....	2	1	1	
Oxide	1–2–3	....	1	3	2	1–3	1	
Peptonate	....	....	....	....	2	....	....	
Phosphate	1–2	....	....	....	2	1	1	
Pyrophosphate	....	....	....	....	2	....	1	
Sulphate	1–2–3	....	1–2	3	1*–1–2	1–2–3	1	
Sulphide Lumps or Sticks	1	....	1–2–3	....	2	1	1	
Wire No. 30 for Standardizing	1	....	1	....	1*	....	1	
Kaolin	1–2	....	....	....	3	....	....	
Lacmoid	....	1	....	....	1*	....	....	
Lactose	1–2	1–2	....	....	1–2	....	1	
Lead Metal	1	....	1	....	2	....	1	
Free from Ag	1	....	1	....	1	....	1	
Acetate	1–2–3	....	1–2–3	2–3	1–2	1–2–3	1	
Acetate, Neutral	1	....	1–3	....	1*–1	1–2–3	1	
Arsenate	1–2	....	....	3	2	1	1	
Arsenite	....	....	....	....	2	1	1	
Acetate Basic Sugar Anal	1	....	1	....	1	....	1	

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company
Lead Borate	1-2	....	....	....	1	1	1
Bromide	....	....	....	....	2	1	1
Carbonate	1-2	....	1	....	1	1	1
Chloride	1-2	....	1	....	1	1	1
Chromate	1-2	....	1	....	1	1	1
Iodide	1-2	....	....	....	2	....	1
Lactate	....	....	....	....	....	....	1
Nitrate	1-2-3	....	1	....	1	1	1
Oxide, Brown Manganese Free	....	....	....	3	1	1-3	1
Oxide, Brown for Ultimate Anal	....	....	....	3	1*	1	1
Oxide	1-2	....	1	3	1	1	1
Oxide, Yellow	2	....	1-2	....	1-2	1	1
Peroxide	1-2	....	1-2	....	2	1-3	1
Phosphate	1	....	....	....	1	1	1
Refined	....	....	....	....	1	....	1
Subacetate, Sol	1	....	....	....	2	....	1
Sulphate	1-2	....	1	....	1	1	1
Sulphide	1	....	....	....	1	1	1
Tartrate	1	....	....	....	....	1	1
Lecithin	....	2	....	....	2	2	....
Lithium Acetate	2	....	....	....	2	1	1
Benzoate	2	....	....	....	2	....	1
Bromide	2	....	....	....	2	....	1
Carbonate	1-2	....	1-2	....	1-2	1-2	1
Chloride	1-2	....	1	....	1	1	1
Citrate	2	....	....	....	....	....	1
Fluoride	1	....	1-2	....	....	....	1
Nitrate	1-2	....	1	....	1-2	1	1
Salicylate	2	....	....	....	2	....	....
Sulphate	1	....	....	....	1	1	1
Litmus Cubes	1	....	1	....	2	....	1
Paper, Blue, Red or Neutral	1	....	1	....	2	1	1
Magnesite	1-3	....	2	3	....	....	1
Magnesium (Metal)	1	1	1	....	2	....	1
Bromide	1-2	....	....	....	1	1	1
Carbonate	1-2	....	1	....	1*-1-2	1	1
Chloride, Cryst	1-2-3	....	1	3	1*-1-2	1	1
Citrate	1-2	....	....	....	2	....	1
Glycerophosphate	2	....	....	....	2	....	....
Hypophosphite	2	....	....	....	2	2	....
Iodide	....	....	....	....	....	....	1
Nitrate	1-2-3	....	1	....	1	1-2	1
Oxide, Sulphur Free	1	....	1	....	1*	1	1
Peroxide	2	....	....	....	2	....	1
Phosphate	1-2	....	....	....	2	1	1
Phosphate, Dibasic	....	....	....	....	1-2	1	1
Phosphate, Tribasic	....	....	....	....	1-2	1	1
Salicylate	2	....	....	....	2	....	1
Silicate	1	....	....	....	2	1	....
Sulphate	1-2	....	1-2	2-3	1*-1-2-3	1	1
Sulphate, Dried Anhyd	1-2	....	....	....	1	1	1
Malachite Green	....	2	....	....	2	....	....
Maltose	....	1	....	....	2	....	....
Manganese (Metal)	1	....	....	....	2	2	1
Acetate	1	....	....	....	2	1-3	1
Bromide	....	....	....	....	....	1	1
Carbonate	1-2	....	1	....	1	1	1
Chloride	1-2	....	1	....	1-2	1-2-3	1
Citrate	....	....	....	....	2	....	....
Dioxide	....	....	1-2	....	1-2	1	1
Glycerophosphate	....	....	....	....	2	....	....
Hypophosphite	....	....	....	....	2	2	....
Iodide	....	....	....	....	2	....	1
Nitrate	1	....	1	....	....	1	1
Nitrate, Liquid 50%	....	....	....	....	1	....	1
Phosphate	1	....	....	....	2	1	1
Sulphate	1-2	....	1	....	1-2	1-3	1
Marble Chips	....	....	2	....	....	....	1-3
Menthol	2	1	....	....	2	....	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Mercurous Chloride (Calomel)	2	....	1	....	1*-1-2	....	1	....
Chloride (Electrolytic for Standardization)	1-2	....	....	....	1	....	1	....
Mercury	2-3	....	1-2	....	1*-1-2-3	....	1	....
Acetate	2	2	1	....	1	....	1	....
Ammonium Chloride	....	....	....	....	2	....	1	....
Bichloride	1-2	....	1	....	1*-1-2	....	1	....
Blue Mass	....	....	....	....	2	....	....	....
Blue Ointment	....	....	....	....	2	....	....	....
Bromide	1	....	....	....	1	....	1	....
Cyanide	1-2	....	....	....	1	....	1	....
Iodide	2	....	....	....	1	....	1	....
Nitrate	1-2	....	1	....	1	....	1	....
Oxide Yellow	2	....	1	....	1*-1-2	....	1	....
Oxide Red	1-2	....	1	....	1-2	....	1	....
Sulphate	1-2	....	1	....	1	....	1	....
Sulphide Red	1-2	....	1	....	1	....	1	....
White Precipitate	....	....	....	....	2	....	....	....
& Potassium Iodide	....	....	....	....	2	....	1	....
Methylene Blue	2	1-2	....	....	1*-2	....	....	....
Methyl Acetate	....	1-2	2	....	2	....	1	....
Iodide	1	1	....	....	2	....	1	....
Orange	1	1	1	....	1*	1	1	....
Red	1	1	1	....	1*	1	1	....
Salicylate	1	1-2	....	....	2	....	1	....
Violet	....	1	....	....	2	....	....	....
Microcosmic Salts	1-2	....	1	....	1*-1-2	1-2	1	....
Monomethyl-Para-Amido-Phenol Sulphate	....	2	....	....	2	....	....	....
Morphine	....	....	....	....	2	....	....	....
Morphine Ethyl	....	....	....	....	2	....	....	....
Naphthalene	1-2	1-2	....	....	2	....	1	....
Naphthol	1-2-3	1-2	1	....	2	....	1	....
Naphthylamine	1	1	....	....	....	....	1	....
Nessler's Solution	....	....	....	....	2	....	1	....
Neutral Red	....	1-3	....	....	....	....	....	....
Nickel Metal, Shot	1	....	1	....	2	....	1	....
Acetate	1-2	....	....	....	1	1-2	1	....
Ammonium Chloride	....	....	....	....	2	....	1	....
Ammonium Sulphate	1-2	....	1	....	1*-1	1-3	1	....
Bromide	....	....	....	....	2	....	1	....
Carbonate	1-2-3	....	1	....	1	1	1	....
Chloride	1-2-3	....	1	....	1-2	1	1	....
Nitrate	1-2	....	1-2	....	1	1	1	....
Oxide	1-2	....	1	3	2	1	1	....
Sulphate	1-2-3	....	1	3	1	1-3	1	....
Nicotine	....	1-2	....	3	....	....	....	....
Nitroso Betanaphthol	1-2	1	1	....	1	....	1	....
Nitrobenzene	1	1-2	2	....	2	....	1	....
Nitron	....	1	....	....	....	....	....	....
Nitrotoluene	....	1	....	....	....	....	....	....
Oenanthic Ether	....	1	....	....	....	....	....	....
Oil, Cottonseed	1	....	....	....	....	....	....	....
Mineral	....	....	....	....	2	....	....	....
Osmium	....	....	....	....	2	....	....	....
Pancreatin	....	....	....	....	2	....	....	....
Papain	....	....	....	....	2	....	....	....
Paper, Congo	....	....	....	....	....	1	1	....
Filter	....	....	1	....	....	....	1	Eaton-Dikeman Co.
Litmus	1	....	1	....	2	1	1	....
Phenolphthalein	....	....	....	....	....	1	1	....
Turmeric	....	....	1	....	....	1	1	....
Paraldehyde	2	1-2	....	....	2	....	....	....
Para-Aminophenol	....	1	....	....	....	....	....	....
Para-Dichlorbenzene	....	1-2	....	....	2	....	....	....
Paraffin	....	....	1	....	....	....	1-3	....
Para-Formaldehyde	....	1	....	....	2	....	....	....
Para-Nitrochlorobenzene	....	1-2	....	....	....	....	....	....
Pepsin	....	....	....	....	2	....	....	....
Peptone Witter's	....	....	....	....	2	....	....	....
Petrolatum	1	....	2	....	2	....	....	....
Pharmaceuticals	1-2-3	....	....	....	2	1-2-3	....	....

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Phenolphthalein	2	1	1	....	1*	....	1	....
Phenol	1-2	1	1	....	1*-1-2	....	1	....
Phenylhydrazine	1	1	....	....	2	1	1	....
Hydrochloride	1	1	....	....	2	....	1	....
pH. Indicators	....	1	....	....	....	....	....	....
Phloroglucinol	....	1	....	....	1*	1	....	....
Phosphoric Anhydride	1	....	1	....	2	1	1	....
Phosphorus	2	....	....	....	2	....	....	....
Oxychloride	1	2	....	....	....	1	1	....
Pentachloride	1	2	1-2-3	....	....	1	1	....
Pentasulphide	1	2	....	....	....	1	1	....
Red Amorphous	1	....	1	....	2	2	1	....
Sticks Yellow	2	....	2	....	2	....	1	....
Trichloride	1	2	1	....	2	1	1	....
Phthalic Anhydride	....	1	....	....	1	....	1	....
Pilocarpine	....	....	....	....	2	....	....	....
Piperine	....	1	....	....	2	....	....	....
Plaster Paris	3	....	2	....	3	....	....	....
Platinum Chloride	1	....	1	....	1*-2	....	1	....
Solutions	....	....	1	....	....	....	1	....
Potassium (Metal)	1	....	1	....	2	1	1	....
Acetate	1-2	....	1	....	1	1-2	1	....
Acid Phosphate	....	....	....	....	1	1-2	1	....
Acid Phthalate	....	....	....	....	1*	....	1	....
Arsenate	1-2	....	....	....	1	1	1	....
Arsenite	1-2	....	1	....	2	1	1	....
Bicarbonate	1-2	....	1	....	1*-1-2	1	1	....
Bichromate	1-2-3	....	1-2	3	1*-1-2	1	1	....
Biniodate	....	....	....	....	2	1	1	....
Binoxalate	1-3	....	1	....	1	1	1	....
Bisulphate, Fused	1- -3	....	1	....	1*-1	1	1	....
Bisulphate, Cryst	1-3	....	1	....	1-2	1	1	....
(meta) Bisulphite	1-2	....	1	....	1	1-3	1	....
Bitartrate, Cryst	....	....	....	....	1-2	....	1	....
Bitartrate, Po	1-2	....	1	....	1-2	....	1	....
Bromate	1-2	....	1	....	1*-1	1	1	....
Bromide	1-2	....	1	....	1*-1-2	....	1	....
Carbonate, Cryst	1	....	1	....	1-2	1	1	....
Carbonate, Po	2	2	1	....	1*-1-2	1	1	....
Chlorate, Cryst	1-2	....	1	3	1*-1-2	1	....	....
Chlorate, Po	2	....	....	....	1-2	....	1	....
Chloride	1-2-3	....	1	....	1*-1-2	1	1	....
Chromate	1-2	....	1	3	1*-1	1-3	1	....
Citrate	1-2	....	1	....	1-2	....	1	....
Cyanide	1-2-3	1	2	....	1-2	1-2-3	1	....
Ferricyanide	1-2-3	....	1-2	....	1*-1-2	1	1	....
Ferrocyanide	1-2	....	1-2	....	1*-1-2	1	1	....
Fluoride	1-2-3	....	1	....	1	1	1	....
Glycerophosphate	1	....	....	....	2	....	....	....
Hydroxide	1-2-3	....	1-2	....	1*-1-2	1-2	1	....
Hypophosphite	2	....	....	....	2	2	1	....
Iodate	1-2	....	1	....	1*-1	....	1	....
Iodide	1-2	1	1-2	....	1*-1-2	....	1	....
Iodide Neutral	....	....	....	....	2	....	1	....
Metabisulphite	1	....	....	....	2	1-3	1	....
(Metal) Balls	....	....	1	....	2	1	1	....
Nitrate	1-2	....	1	3	1*-1	1	1	....
Nitrite, Sticks	2	....	1	....	1-2	1-2	1	....
Oxalate, Neutral	2	....	1	....	1*-1	1	1	....
Perchlorate	1	....	....	....	1*-2	1	1	....
Permanganate	1-2	....	1-2	....	1*-1-2	1-2	1	....
Persulphate	1-2	....	....	....	1*-1	1	1	....
Phosphate, Monobasic	1-2	....	1	....	1*-1	1-2	1	....
Phosphate, Dibasic	1-2	....	1	....	1-2	1	1	....
Phosphate, Tribasic	1-2	....	....	....	1-2	1	1	....
Pyrophosphate	1	....	....	....	2	1	1	....
Silicate	....	....	....	....	2	1	1	....
Sodium Tartrate	1-2	....	....	....	1*-1-2	....	1	....
Sulphate, Cryst	1-2	....	1-2-3	....	1*-1-2	1-2	1	....
Sulphate, Po	2	....	....	....	1-2	1	1	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Potassium Sulphide	1	....	2	....	2	1	1	....
Sulphite	1-2	....	....	....	2	1	1	....
Sulphocyanide	1-2-3	....	1	....	1*-1	1	1	....
Tartrate, Cryst	1-2	....	1	....	1	1	1	....
& Sodium Tartrate, Cryst	1	....	1	....	1*-1-2	....	1	....
& Sodium Tartrate, Po	2	....	....	....	1-2	....	1	....
Procaine	....	....	....	....	2	....	....	....
Pyridine	1-3	1-3	....	....	1	....	1	....
Pyrogallol	1-2	1	1	....	1-2	....	1	....
Quinine	2	....	....	....	2	....	....	....
Raffinose	....	1	....	....	2	....	....	....
Reagents	1-2-3	1	1	....	1*-1	1-2-3	1	....
Blood	1-2-3	1	....	....	1*-1	....	....	....
Diagnostic	1-2-3	....	....	....	1-2	....	....	....
Resorcinol	2	1	1	....	1*-2	2	1	....
Saccharose	2	....	....	....	1-2	....	1	....
Saccharin	1-2	1	....	....	2	....	1	....
Sanguinarine Nitrate	....	....	....	....	2	....	....	....
Santonin	....	....	....	....	2	....	....	....
Saponin	....	....	....	....	2	1-2-3	....	....
Sea Sand	....	....	....	....	1	....	1-3	....
Selenium	....	....	1	....	2	1	....	....
Silicon Dioxide	....	....	....	....	....	1	1	....
Silver Acetate	....	....	....	....	2	....	1	....
Bromide	....	....	....	....	2	....	1	....
Chloride	1	....	....	....	2	....	1	....
Nitrate	1-2	1	1	....	1*-1-2	....	1	....
Sulphate	1	....	1	....	1*-1	....	1	....
Soda Lime No. 4 Mesh	1	....	1-2	....	1	1	1	....
Sodium, Metal	1	....	1	....	1*-2	1	1	....
Acetate, Cryst	1-2-3	2	1-2	3	1*-1-2	1-2	1	....
Acetate, Anhydr	1-2	3	1	....	1	1	1	....
Aluminum Sulphate	1-2	....	....	3	....	1	1	....
Amalgam	....	1	1	....	....	....	1	....
Ammonium Phosphate	1-2	....	1	....	1*-1	1-2	1	....
Arsenate	1-2	....	1	....	1-2	1	1	....
Arsenite	1-2	....	1	....	2	1	1	....
Benzoate	2	1	....	....	2	....	1	....
Bicarbonate	1-2	....	1-2	2	1*-1	1	1	....
Bicarbonate USP	2	....	....	2	2	....	2	....
Bichromate	1-2-3	....	1	3	1-2	1	1	....
Bismuthate	1-2	....	1	....	1*	....	1	....
Bisulphate, Cryst	1-2-3	....	1	....	1-2	1	1	....
Bisulphate, Fused	1-2-3	....	1	3	1	1	1	....
Bisulphite	1-2	1	1-2-3	3	1	1	1	....
Bitartrate	1-2	....	1	....	1-2	1	1	....
Borate, Cryst. & Po	2	....	1-2	....	1*-1-2	1	1	....
Bromate	1-2	....	....	....	1	1	1	....
Bromide	1-2	....	1	....	2	....	1	....
Calcium Hydrate	1	....	1-2	....	1*-1-2	1	1	....
Carbonate, Dried	....	....	....	....	1-2	1	1	....
Carbonate, Cryst	1-2-3	....	1-2	3	1*-1-2	1	1	....
Carbonate, Anhydr	1-2-3	....	1-2	3	1*-1	1-2	1	....
Chlorate	1-2	....	1	3	1-2	1	1	....
Chloride, Cryst. or Gran	1-2	....	1-2	....	1*-1	1	1	....
Chromate	1-2	....	1	....	1	1	1	....
Citrate	1-2	....	1	....	1-2	....	1	....
Cyanide	1-2-3	1	1	3	1*-1	....	1	....
Ethylate	....	....	....	....	....	....	1	....
Fluoride	1-2-3	....	1-2-3	3	1-2	1-3	1	....
Formate	1-2	....	....	....	1	1	1	....
Hydroxide, from Sodium	....	....	....	3	1*	1	1	....
Hydroxide Sticks (so-called By Alcohol)	1-2	....	1-2	....	1*-1	1-2	1	....
Hydrosulphite	1	....	....	....	....	....	1	....
Hypochlorite	....	....	1	....	....	....	1	....
Hypophosphite	1-2	....	....	....	2	1-2	1	....
Iodate	1	....	....	....	1	....	1	....
Iodide	1-2	....	1	....	1-2	....	1	....
Metal	....	....	1	....	1*-2	1	1	....
Molybdate	1-3	....	....	....	1	1	1	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Sodium, Nitrate, Cryst	1-2	....	1-2	3	1*-1	1	1	....
Nitrite, Sticks	1-2	....	1	....	1*-1-2	1-2	1	....
Nitrite, Gran	2-3	....	2	3	1	1	1	....
Nitroprusside	1	....	1	....	1*-1	1	1	....
Oleate	2	....	....	....	1-2	....	1	....
Oxalate	1-2-3	....	1	....	1-2	1	1	....
Oxalate Soerensen's fro. standardization	1	....	....	....	1*	1	1	....
Perchlorate	1-2	....	....	....	2	....	1	....
Peroxide	1-2	....	1	....	1*-1	....	1	....
Phosphate, Dibasic	....	....	1-3	2-3	1*-1-2	1	1	....
Phosphate, Monobasic	....	....	1	....	1-2	1	1	....
Phosphate, Tribasic	....	....	1-3	2-3	1-2	1	1	....
Phosphate	1-2-3	....	....	2-3	1*-1-2	1	1	....
Phosphate, Dibasic Anhydr	....	....	....	....	1*	1	1	....
Pyrophosphate	1-2-3	....	....	....	1*-1	1	1	....
Potassium Carbonate	1	....	....	....	2	1	1	....
Salicylate	1-2	1	....	....	1-2	....	1	....
Silicate	1	....	2-3	3	3	1	1-3	....
Silicofluoride	1	....	1	3	1	1-3	1	....
Succinate	1	1	....	....	2	....	1	....
Sulphate, Cryst	1-2	....	1-2-3	3	1*-1-2	1	1	....
Sulphate, Anhyd	1-3	....	1	3	1*-1-2	1	1	....
Sulphite	1-2	....	3	3	....	1	1	....
Sulphide	1-2	....	1-2-3	3	1*-1-2	1	1	....
Sulphite, Cryst	1-2	....	1-2-3	3	1-2	1	1	....
Sulphite, Anhydr	1	....	1-3	....	1*-1	1	1	....
Tartrate	1-2	....	1	....	1	1	1	....
Thiosulphate, Cryst	1-2	....	1-2-3	3	1*-1-2-3	1	1	....
Thiosulphate, Anhydr	....	....	1	....	1-2	1	1	....
Thiocyanate	1-2-3	....	1	....	1-2	1-2	1	....
Tungstate	1-2	....	....	....	1*-1	1	1	....
Solutions, Volumetric	....	....	1	....	2	1	1	....
Solvents	....	1	....	3	....	....	1	....
Sparteine Sulphate	....	....	....	....	2	....	....	....
Starch, Arrowroot	1	....	1	....	....	....	1	....
Corn	1	....	....	....	....	....	1	....
Iodized	1	....	....	....	....	....	1	....
Potato	1	....	1	....	....	....	1	....
Soluble	1	2	1	....	1	1	1	....
Wheat	1	....	1	....	....	....	1	....
Strontium Acetate	1	....	....	....	1	1	1	....
Bromide	1-2	....	....	....	2	....	1	....
Carbonate	1-2-3	....	1	....	1	1	1	....
Chloride	1-2	....	1	....	1-2	1	1	....
Chloride, Barium Free	....	....	....	....	1*	1	1	....
Hydroxide	1-3	....	....	....	2	1	1	....
Iodide	....	....	....	....	2	....	1	....
Nitrate	1-2-3	....	1	3	1-2	1	1	....
Sulphate	1-2	....	1	....	2	1-2	1	....
Strophanthin	....	....	....	....	2	....	....	....
Strychnine	....	....	....	....	2	....	....	....
Sucrose, Cryst	1	....	....	....	1-2	....	1	....
Sugars, Rare	....	1	....	....	2	....	....	....
Sulphur, Precip	2	....	2	....	2	2	1	....
Chloride	1	2	2	....	2	....	1	....
Dioxide (Anhyd.)	1	....	1	3	....	....	1	....
Iodide	....	....	....	....	....	....	1	....
Superolol	....	....	....	....	1*-1	....	....	....
Tartar Emetic	2-3	....	....	....	2	1	1	....
Terpin Hydrate	2	1	....	....	2	2	....	....
Terpineol	....	1	....	....	2	1	....	....
Test Papers	....	....	1	....	....	1	1	....
Tetraiodofluorescein	....	1	....	....	2	....	....	....
Theobromine	....	1	....	....	2	....	....	....
Thorium Salts	....	....	....	....	....	....	1	....
Thymol	2	1	....	....	1*-2	....	....	....
Blue	....	1	....	....	....	....	....	....
Iodide	2	....	....	....	2	....	....	....
Phthalein	....	1	....	....	....	....	....	....
Tin (Metal), Mossy, Sticks & 20-30 Mesh	1	....	1	....	1-2	....	1	....

Chemical	J. T. Baker Chemical Co.†	Eastman Kodak Co.	General Chemical Co.§	Grasselli Chemical Co.	Merck & Co. Inc.	Pfaltz & Bauer, Inc.	Sterling Products Company	
Tin Bichloride	1–3	....	1–3	3	1*–2	1	1	....
Chloride	....	....	1–2	3	1*–1–2	1	1	....
Oxide	....	....	....	3	1–2	1	1	....
Toluene	1–2	1–2	2	....	1–2	1	1	....
Tungsten & Salts	....	....	....	....	....	1	1	....
Uranium Acetate Na. Free	1–2	....	....	....	1*	1	1	....
Acetate	1	....	....	....	....	1	1	....
Nitrate	1–2	....	1	....	1	1	1	....
Nitrate, Fr. Fr. Alkali Salts	1	....	....	....	1*	1	1	....
Salts	....	....	....	....	....	1	1	....
Urea	1–2	1	....	....	1–2	1	....	....
Vaccines	....	....	....	....	....	....	....	....
Vanillin	....	1	....	....	2	1	....	....
Veratrine & Its Salts	....	....	....	....	2	2	....	....
Volumetric Solutions	....	....	1	....	2	1	1	....
Whiting	....	....	....	3	2	....	....	....
Xylene	1–2	1–2–3	2	....	1–2	1	1	....
Zinc Metal	1–2	....	1	3	1*–1–2–3	....	1	....
Metal, As. Free, Mossy-shot-sticks 10–20 mesh	1	....	1	3	1*	....	1	....
Metal, Mossy,—shot sticks po. 10–20	1–2	....	1–2	....	1*–1	....	1	....
Acetate	1–2	....	....	....	1–2	1–2	1	....
Bromide	1–2	....	....	....	2	....	1	....
Carbonate	1–2	....	1	....	1–2	1–3	1	....
Chloride, Gran	1–2–3	....	1	3	1*–1–2	1	1	....
Chloride, Sticks	1–2	....	1	....	1–2	1	1	....
Cyanide	....	....	....	....	....	....	1	....
Iodide	....	....	....	....	2	....	1	....
Nitrate, Cryst	1–2	....	1	....	1–2	1	1	....
Oxalate	1	....	....	....	2	1	1	....
Oxide, Wet Proc	1	....	....	3	1*–1–2	1	1	....
Stearate	2	....	....	3	2	2	1	....
Sulphate, Cryst	1–3	....	1	3	1*–1–2	1–2–3	1	....
Sulphate, Po	1	....	....	....	1–2	1–2–3	1	....
Sulphide	1	....	....	....	2	1	1	....

Merck's Laboratory Chemical Catalog contains a complete list of our Reagents and C. P.s, as well as many other chemicals commonly used in the laboratory.

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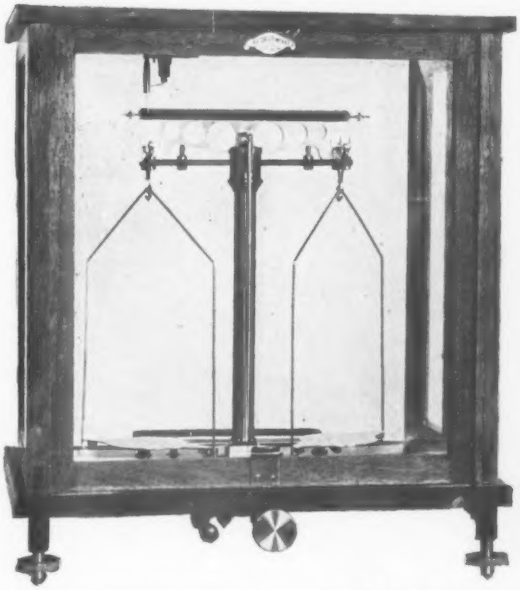

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The Sartorius Student Balance is of simplified construction, but is correct as to theory in its design. The correct theoretical design in combination with precision workmanship results in a balance admirably suited to the needs of the educational institution and small industrial laboratory.

DESCRIPTION

Capacity: 200 grams on each pan.

Sensitivity: 1/10th mg. i. e., a change of weight of 1 mg. deflects the pointer on the scale 2 divisions with full load or 3 divisions without load.

Beam: Aluminum alloy, 6¼ inches between end knife edges, graduated with 50 divisions on each side. The divisions are white on a black background. With a 10 mg. rider each division corresponds to 1/5 mg.

Knife Edges and Planes: Finest agate accurately ground and polished.

Arrestment and Release: The fallaway type with automatic pan arrestment. The beam and hangers are each arrested in two places.

Pans and Bows: The bows are of German silver, 8¼ inches high and 4¼ inches wide. The pans are of polished aluminum, slightly concave and are 2½ inches in diameter.

Rider Carrier: Has one hook and is mounted directly over the beam. A patented device prevents the rider from accidentally falling off.

Pointer Scale: White background with 12 black divisions on each side.

Column: Of highly polished heavy brass tubing.

Case: Polished Mahogany with slate base and leveling screws. Dimensions: Width 15 inches, height 10¼ inches, depth 9 inches.

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Knife Edges and Planes: Finest agate, accurately ground and polished.

Arrestment and Release: Fallaway type, releasing knife edges and pans with one movement.

Pans and Bows: Bows of nickel, 9 inches high and 5 inches wide at bottom. Pans of highly polished nickel, 3 inches in diameter.

Rider Carrier: One hook directly over center column. Patented device prevents rider from accidentally falling off the hook.

Pointer Scale: White background with 12 black divisions each side.

Column: Heavy brass tubing lacquered black.

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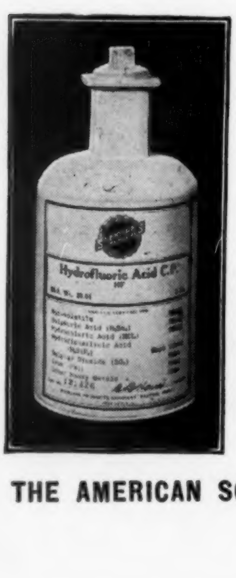

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EDUCATIONAL EQUIPMENT AND SUPPLIES

The distributors whose cards appear on this and following pages are of two types—laboratory supply houses and firms dealing in classroom equipment. The latter, in most instances, carry a listing of the principal manufacturers whom they represent. All of the distributors, however, maintain stocks of educational equipment or laboratory supplies for efficient service to the territories covered by them. For convenience in locating the distributors of any particular region the cards have been arranged geographically by sections, commencing with New England and concluding with the Pacific Coast States.

EDWARD E. BABB & CO., INC.
Established 1885

212 SUMMER ST.
BOSTON

Corner 33rd & Arch Streets
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EDUCATIONAL SUPPLIES AND EQUIPMENT
Distributors for

Eberhard Faber Pencils, Penholders, Erasers
A. J. Nystrom Maps, Globes
Binney & Smith Crayons, Chalks
Heywood-Wakefield School Furniture
Harter Modern Seat Work
Munsell Color System
Springfield Portable School Houses
Kaustine Sanitary Toilets and Heaters
The Shade Service Bureau
Detroit "Atlas" Portable Bleachers
Palmer Janitor's Supplies
Columbia Indestructo Desks
Viking Steel Chairs

Member: *National School Supply Association*

J. L. HAMMETT COMPANY
CAMBRIDGE, MASS.

SCHOOL SUPPLIES

Paper, Composition Books, Pads, School Furniture, Blackboards, Maps and Globes

Member: *National School Supply Association*

BARDEEN SCHOOL SUPPLIES, INC.
SYRACUSE, NEW YORK

DISTRIBUTORS FOR

Weber Costello Co.
Shade Service Bureau
Binney & Smith Co.
Smith System Heating Co.
Giant Playground Equipment
Lee Lash Stage Equipment

Manufacturers of

DIPLOMAS SCHOOL RECORDS

Member: *National School Supply Association*

R. A. FIFE CORPORATION, Mamaroneck, New York
Representing

E. H. Sheldon & Co.	Laboratory Furniture
Theodor Kundtz Co.	School Desks
Imperial Desk Co.	Office Furniture
Everwear Mfg. Co.	Playground Apparatus
Draper Shade Co.	Window Shades
Allen Chair Co.	Chairs
Weber Costello Co.	Blackboard Products
Gunn Furniture Co.	Library Furniture, etc., Cafeteria Tables
Wittliff Furniture Brace Co.	Chair Braces
Chicago Gymnasium Equipment Co.	Gymnasium Apparatus
National Slate Machine Co.	Slate Blackboard Resurfacing
National Renovating & Supply Co.	Renovation of School Desks

Member: *National School Supply Association*

The American School and University maintains complete files of manufacturers' catalogs for the convenience of its readers. If you wish literature concerning materials, equipment or supplies simply note the subjects of your interest on one of the return addressed cards opposite page 552 and mail to us.

Section XIII

ARCHITECTS
FOR EDUCATIONAL BUILDINGS

The following directory is restricted to architects who, during the last five years, have designed three or more school or college buildings costing over $50,000 each.

Many of these architects have, of course, handled during this period a much larger amount of work in the educational field than that shown. Space limitations, however, have necessitated the restricting of each architect to three listings, and the buildings mentioned are regarded as typical examples of the architects' recent work.

No attempt has been made to evaluate the skill or professional standing of the architects listed. Boards of Education and persons interested in the construction of new buildings can obtain valuable advice in this matter from the presidents of the local chapters of the American Institute of Architects, or from the national headquarters of that organization, The Octagon, Washington, D. C., or from such sources as the United States Bureau of Education, the respective state departments of education, the Bureau of Education of the National Catholic Welfare Conference, or the Department of Educational Administration of Teachers College, Columbia University, New York.

The 48 states are arranged in alphabetical order, followed by the Canadian provinces in alphabetical order. Under each state heading and province the sequence is not by cities, but by architects' names for the entire state or province in alphabetical order.

ALABAMA

Fredrick Ausfeld, Montgomery
Sidney Lanier High School, Montgomery
Gymnasium Building, Montgomery
Junior High School, Montgomery

Denham & Denham, Birmingham
Fairfield High School, Fairfield
Ensley-Howard High School, Ensley (affiliated with Howard College, Birmingham)
Mountain Brook Elementary School, Jefferson County

Hirsch & Jones, Montgomery
Dothan Elementary School, Dothan
Additions to Junior High School, Dothan
Additions to Enterprise Elementary School, Enterprise

Miller & Martin, Architects; **J. A. Lewis,** Engineer, Birmingham
Group of eight buildings for the University of Alabama, Tuscaloosa
Group of two buildings for Birmingham-Southern College, Birmingham
Two school buildings for Board of Education, Birmingham

Bem Price, Birmingham
Tupelo High School, Tupelo, Miss.
Minor High School, Jefferson County
Dormitory, Athens College, Athens

W. A. Rayfield, Birmingham
National Training School for Girls, Washington, D. C.
Banks School of Music, Birmingham
Alabama Association for the Blind, Birmingham.

George B. Rogers, Mobile
High School, Mobile
High School, Mobile
Library, Spring Hill College, Mobile

A. Duncan Simpson, Gadsden
Gadsden High School, Gadsden
Etowah Grammar School, Gadsden
East Gadsden Grammar School, Gadsden

Matthews H. Tardy, Birmingham
Roanoke Senior High School, Roanoke, Va.
Roanoke Junior High School, Roanoke, Va.
Consolidated School, Rockymount, Va.

Warren, Knight & Davis, Birmingham
Erskine Ramsay Engineering Building, Alabama Polytechnic Institute, Auburn
Chemistry Building, University of Alabama, Tuscaloosa
New group of buildings, Alabama College, Montevallo

Wm. Leslie Welton, Birmingham
Athenaeum, Parochial School, Birmingham
Robinson School, Birmingham
Gorgas School, Birmingham

ARIZONA

Fitzhugh & Byron, Phoenix
Phoenix Junior College, Phoenix
Clarkdale High School, Clarkdale
Phoenix Union High School (colored), Phoenix

Lescher & Mahoney, Phoenix
Training School, Arizona State Teachers College, Temple
Stadium, Phoenix Union High School, Phoenix
John Greenleaf Whittier Grade School, Phoenix

Roy Place, Tucson
University of Arizona Group, Tucson
High School, Tucson
Grade School, Tucson

Trost & Trost, Phoenix (also El Paso, Texas)
Loretta College, El Paso, Texas
Library, Sul Ross Teachers College, Alpine, Texas
Winslow High School, Winslow

ARKANSAS

Almand & Stuck, Little Rock
Morrilton High School, Morrilton
Bentonville High School, Bentonville
Little Rock Senior High School, Little Rock
(Mann & Stern, John Parks Almand, and Wittenberg & Delong, Associate Architects)

James Dinwiddie, Fayetteville
Washington Grade School, Springdale, and Westside School, Fayetteville
High School with Annexes, Fayetteville
Junior-Senior High School, Springdale

George R. Mann, Wanger & King, Little Rock
North Little Rock High School, North Little Rock
Hickory Street School, North Little Rock
Four rural schools, Pulaski County

Eugene John Stern, Little Rock
Little Rock Senior High School and Junior College, Little Rock
Pulaski Heights Grade School, Little Rock
Hot Springs Junior High School, Hot Springs

Witt, Seibert & Halsey, Texarkana (also Texarkana, Texas)
Junior College, Texarkana
High School, Texarkana
Practice Building and Library, State Teachers College, Conway

E. J. Wolpert, Jonesboro
Woodland Junior High School, Jonesboro
Tyronza High School, Tyronza
North School, Jonesboro

CALIFORNIA

Allison & Allison, Los Angeles
Auditorium and classroom building, University of California, Los Angeles
Physics Building, University of California, Los Angeles
Kerckhoff Union Building, University of California, Los Angeles

Arthur W. Angel, Los Angeles
Auditorium Building and Intermediate School, Irvington Intermediate School, Huntington Park
Elementary School, Huntington Park

W. Horace Austin, Long Beach
Olive Avenue Junior High School, Compton
Addition to Woodrow Wilson High School, Long Beach (not yet built)
Addition to Long Beach Polytechnic High School, Long Beach (not yet built)

Richard M. Bates, Jr., Los Angeles
La Ballona Junior High School, Culver City
South Whittier Junior High School, Whittier
Azusa City School, Azusa

Edwin Bergstrom, Los Angeles
Auditorium and Administration Building, John C. Fremont High School, Los Angeles
Science and Shop Buildings, same
Boys' and Girls' Gymnasium Buildings, same

Charles H. Biggar, Bakersfield
Kern County Union High School Group
Lincoln School, Bakersfield
Standard School, Oildale

Howard G. Bissell (formerly Mayo, Bissell & Co.), Stockton
Auditorium and Conservatory Building, College of the Pacific, Stockton (Associated with Dairs-Pearce Co., Stockton)
New group of buildings, Calaveras Union High School, San Andreas

Leon Caryl Brockway, Pasadena
Jefferson Elementary School, Pasadena
Arroyo Seco School, Pasadena
Freemont School, Pasadena

Birge M. Clark, Palo Alto
Palo Alto Union High School, Palo Alto
Washington Union High School Gymnasium, Centerville
Group of buildings for Menlo School for Boys, Atherton

Orville L. Clark, Los Angeles
Paso Robles Union High School, Paso Robles
Russell Elementary School, Los Angeles
Glendale Elementary School, Glendale

W. D. Coates, Jr., Co., Fresno
Hanford Union High School, Hanford
Porterville Union High School, Porterville
Sanger Union High School, Sanger

Alfred I. Coffey, San Francisco
Sequoia Union High School, Redwood City
Mountain View Grammar School, Mountain View
Redwood City Grammar School, Redwood City

Norman R. Coulter, San Francisco
Monterey Union High School, Monterey
Central Elementary School, Sausalito
Del Norte County Union High School, Crescent City

Louis N. Crawford, Santa Maria
Orcutt Union School
Toleta Union School
San Luis Obispo School (T. C. Kistner & Co., Associate Architects)

Davis-Pearce Co., Stockton
The College of the Pacific, Stockton
Marysville Union High School, Marysville
Manteca Union High School, Manteca

John J. Donovan, Oakland
St. Mary's College Group, Moraga
Eureka Junior High School, Eureka
College of Notre Dame, Belmont

Edwards & Schary, San Francisco
Park School, San Mateo
Borel School, San Mateo
Soledad School, Soledad

Frederick H. Eley, Santa Ana
Julia Lathrop Junior High School, Santa Ana
Roosevelt Grade School, Santa Ana
Gymnasium, High School, Santa Ana

Rudolph Falkenrath, Jr., Los Angeles
Norma Gould School of the Dance, Los Angeles
Wonderland Avenue School, Los Angeles
102nd Street School, Los Angeles

Gable & Wyant, Los Angeles
Hawthorne Elementary School (three buildings), Beverly Hills
Beverly Vista Elementary School (four buildings), Beverly Hills

Louis J. Gill, San Diego
Scripps Institute of Oceanography Laboratory, University of California, San Diego
Bishop's School for Girls, La Jolla
La Jolla Elementary School, La Jolla

Frank M. Goodwin, Compton
Beryle Heights Grammar School, Redonda Beach
Compton Union High School Gymnasium, Compton
Watts High School, Watts

J. de Forest Griffin, Los Angeles
Chehalis Junior High School, Chehalis, Wash.
Bellarmine Jesuit College Group, Tacoma, Wash.
St. Mary's Academy, Cowlitz, Wash.

William C. Hays, San Francisco
Giannini Hall, University of California, Berkeley
Animal Science Building, University of California, Davis
Agricultural Engineering Building, University of California, Davis

Myron Hunt & H. C. Chambers, Los Angeles
Library, Orr Hall, and Erdman Hall (women's dormitories), Students' Union and Music Building and Chapel, Occidental College, Eagle Rock, Los Angeles
Group of Los Angeles Schools
Girls' Collegiate School, Glendora

Arthur R. Hutchason, Los Angeles
Rockdale School, Los Angeles
Preventorium School, Santa Barbara
San Luis Rey School, San Luis Rey

Jeffery & Schaefer, Los Angeles
Franklin High School, Los Angeles
Montebello High School, Montebello
Banning Union High School, Banning

Howard E. Jones, San Bernardino
San Bernardino Valley Junior College, San Bernardino
San Bernardino Junior High School, San Bernardino
Harding School, San Bernardino

Clarence A. Kelso, Los Angeles
Abraham Lincoln Elementary School, Lynwood (H. E. Mackie, Associate Architect)
Charles A. Lindbergh Elementary School, Lynwood (H. E. Mackie, Associate Architect)
Century Square Elementary School, Lynwood (H. E. Mackie, Associate Architect)

T. C. Kistner & Co., Los Angeles
John C. Fremont Junior High School, Pomona
Herbert Hoover High School, San Diego
Lenzinger High School, Lawndale

J. A. Larralde, Los Angeles
Mill School, near Whittier
Norwalk School, Norwalk
Wiseburn School, Hawthorne

Marsh, Smith & Powell, Los Angeles
Physical Education Building, University of Redlands, Redlands
Junior High School, South Pasadena
Lynwood High School, Lynwood

Mott M. Marston, Los Angeles
Gymnasium, Puente Union High School, Puente
Glenoaks School, Glendale
Washington School, Ventura

Marston, Van Pelt & Maybury, Pasadena
Andrew Jackson Grammar School, Pasadena
Longfellow Grammar School, Pasadena
Central Junior High School, Riverside

Albert C. Martin, Los Angeles
Conaty Memorial High School, Los Angeles
Lomita High School of Los Angeles group
Los Angeles Junior Seminary, Los Angeles

Miller & Pflueger, San Francisco
Jefferson Elementary School, San Francisco
Alamo Elementary School, San Francisco
Roosevelt Junior High School, San Francisco

Miller & Warnecke, Oakland
East Oakland High School, Oakland
Merritt High School, Oakland
Garfield Junior High School, Oakland

DeWitt Mitcham, San Bernardino
Thomas Jefferson Elementary School, San Bernardino
San Bernardino Valley Junior College Gymnasium, San Bernardino
D Street Elementary School, Needles

Morgan, Walls & Clements, Los Angeles
Chouinard School of Art, Los Angeles
Auditorium Unit, Polytechnic High School, Los Angeles
Rosemead Grammar School, Rosemead

Karl W. Muck, County Architect, Los Angeles
Juvenile Hall School (for delinquent minors), Los Angeles
El Retiro School (Girls' Rehabilitation School), San Fernando
Occupational Therapy School (for consumptive children), Olive View

James T. Narbett, Richmond
Roosevelt Junior High School, Richmond
Fairmont Grade School, Richmond
Woodrow Wilson Grade School, Richmond

A. S. Nibecker, Jr., South Pasadena
Richard Henry Dana Junior High School, San Pedro
Victory Boulevard Elementary School, Lankershim
Dorris Place Elementary School, Los Angeles

E. L. Norberg & John E. Norberg, San Francisco
San Mateo High School Group, San Mateo
High School Gymnasium, Burlingame
Calvin Coolidge Grammar School, Burlingame

Pierpont & Walter S. Davis, Los Angeles
Sierra Park School, Los Angeles
Stanford Avenue School, Los Angeles
Palo Verde School, Los Angeles

James W. Plachek, Berkeley
Administration Building for Board of Education, Berkeley
John Muir School, Berkeley
Addition for Garfield School, Berkeley

Scott Quintin, Alhambra
Woodrow Wilson School, San Gabriel
Auditorium, Granada School, Alhambra
Auditorium, Fremont School, Alhambra

Lloyd Rally, Los Angeles
Fremont Avenue Elementary School, Los Angeles
Boys' Gymnasium, Whittier Union High School, Whittier
Classroom Building, Whittier Union High School, Whittier

W. H. Ratcliff, Jr., Berkeley
New group of buildings, Mills College, Oakland (also, general scheme for future development)
New group of buildings, Pacific School of Religion (also, general scheme for future development)
Hillside School, Berkeley

Alfred W. Rea & Chas. E. Garstang, Los Angeles
New group of buildings, El Segundo High School, El Segundo
Administration and Auditorium Building, Compton Union High School, Compton
Chemawa Junior High School, Riverside

Reed & Corlett, Oakland
Chabot Grammar School, Oakland
Additions to Dixon Grammar School, Dixon
Oakland High School, Oakland

M. P. Renfro, San Bernardino
San Bernardino Valley Junior College Gymnasium, San Bernardino
Thomas Jefferson Grammar School, San Bernardino
San Bernardino Junior High School Gymnasium, San Bernardino

Winchton Leamon Risley, Los Angeles
Grammar School, Rivera
Norfolk Street Grammar School, Los Angeles
Dominguez School, Los Angeles

Francis W. Rutherford, Santa Monica
Madison (Platoon) School, Santa Monica
Valley Junior High School, Burbank
Emerson Elementary School, Burbank

Howard Schroder, Oakland
Lowell Junior High School, Oakland
Prescott Domestic Science Unit, Oakland
Cole Elementary School, Oakland

George C. Sellon & Co., Sacramento
Colusa Union High School, Colusa
Loomis Union Grammar School, Loomis
Benicia High, Benicia

Shields, Fisher & Lake, Fresno
Roosevelt High School, Fresno
Addition to Hanford High School, Hanford
Benjamin Franklin School, Fresno

Horace G. Simpson, San Francisco
Sacramento High School and Junior College, Sacramento (Edgar A. Mathews, Associate Architect)
Grass Valley High School, Grass Valley (William Mooser, Associate Architect)
Church School (First Congregational Church), Berkeley

Soule, Murphy & Hastings, Santa Barbara
Roosevelt Elementary School, Santa Barbara
Harding Elementary School, Santa Barbara
Frederick Forrest Peabody Elementary School, Santa Barbara

Fay R. Spangler, Santa Ana
Laguna Grammar School, Laguna Beach
Magnolia Grammar School, Orange County
Yorba Linda Grammar School, Orange County

Starks & Flanders, Sacramento
Davis High School, Davis
Mt. Shasta Union High School, Mt. Shasta
Crocker Grade School, Sacramento

Swartz & Ryland, Fresno
Grammar School, Tulare
Heaton Elementary School, Fresno
Gymnasium, High School, Coalinga

Symmes & Cullimore, Bakersfield
Beardsley Grammar School, Bakersfield
Shafter High School, Shafter
McFarland High School, McFarland

Edward Cray Taylor & Ellis Wing Taylor, Architects and Engineers, Los Angeles
Cabrillo Avenue Elementary School, San Pedro
Home Gardens School, Los Angeles
Hooper Avenue Elementary School, Los Angeles

Ralph D. Taylor, Alturas
Roosevelt Elementary School, Susanville, Lassen County
High School Group, Greenville, Plumas County
Gymnasium Building, Modoc Union High School, Alturas

Walker & Eisen, Los Angeles
Thomas A. Edison Junior High School, Los Angeles
Humphreys Avenue School, Los Angeles
South Park School, Los Angeles

W. H. Weeks, San Francisco
La Cumbre Junior High School, Santa Barbara
Santa Rosa High School, Santa Rosa
Woodrow Wilson Junior High School, San Jose

William H. Wheeler, San Diego
Logan Elementary School, San Diego
Balboa Elementary School, San Diego
Encanto Elementary School, San Diego

G. Stanley Wilson, Riverside
Corona High School, Corona
Brawley Junior College, Brawley
Upland Junior High School, Upland

Roy C. Wilson, Santa Paula
Isbell Grammar School, Santa Paula
Ojai High School, Ojai
Hueneme Grammar School, Hueneme

Carleton Monroe Winslow, Los Angeles
Fullerton Union High School Group, Fullerton
Eagle Rock High School, Los Angeles
Knapp College of Nursing, Santa Barbara

Henry J. Withey, Los Angeles
Fries Avenue Elementary School, Wilmington
Malabar Street Elementary School, Los Angeles
Van Nuys Elementary School, Van Nuys

Ralph Wyckoff, San Jose
Salinas Union High School and Junior College, Salinas
Willow Glen School, Willow Glen
Gilroy High and Elementary Schools, Gilroy

A. C. Zimmerman & A. M. Edelman, Los Angeles
Horace Mann Junior High School, Los Angeles
West Athens School, Los Angeles
52nd Street School, Los Angeles

COLORADO

J. B. Benedict, Denver
Graland Primary School, Denver
Rosedale Primary School, Denver
Students' Chapel, St. Thomas Seminary, Denver

William N. Bowman Co., Denver
Gymnasium, State Teachers College, Greeley
Cole Junior High School, Denver
High School, Fort Collins

T. H. Buell & Co., Denver
North Junior High School, Denver
Asbury Elementary School, Denver
High School, Ovid

Walter DeMordaunt, Pueblo
Park Hill Junior High School, Pueblo
Pleasant View High School, Pueblo
Additions to Junior High School, District No. 20, Pueblo

H. W. J. Edbrook, Denver
Dormitory and Academic Building, Loretto Heights College, Denver
Adams Street School, Denver
Arvoda High School, Arvoda

M. S. Fallis Architect Co., Denver
Garden Place School, Denver
Colorado Woman's College, Denver
Glenwood Springs High School, Glenwood Springs

William E. & Arthur A. Fisher, Denver
South High School, Denver
Morey Junior High School, Denver
Barnes Commercial School, Denver

Robert K. Fuller, Denver
Edison School, Denver
Junior High School, Boulder
Eaton High School, Eaton

Eugene G. Groves, Denver
Library, Colorado Agricultural College, Fort Collins
High School, Canon City
Fairview Grade School, Denver

Henry James Manning, Denver
Residence Hall, Regis College, Denver
Fairmont Grade School, Denver
Washington Park Grade School, Denver

I. H. & W. M. Rapp Co., Trinidad
Willson Hall—Science Building for New Mexico Military Institute, Roswell, N. Mex.
Cahoon Armory for New Mexico Military Institute, Roswell, N. Mex.
Junior High School, Roswell, N. Mex.

E. Floyd Redding, Denver
Opportunity School (Vocational High School), Denver
High School, Nogales, Ariz.
Nurses School and Dormitory, Boulder-Colorado Sanitarium, Boulder

Geo. H. Williamson, Denver
East Senior High School, Denver
William H. Smiley Junior High School, Denver
Lincoln School, Denver

CONNECTICUT

Isaac A. Allen, Jr., Inc., Hartford
Colonel William E. Cone School, Hartford
Vine Street School, Hartford
Addition to Vine Street School, Hartford

Leonard Asheim, Bridgeport
Devon School, Milford
Roosevelt School (City Normal), Bridgeport
Waltersville School, Bridgeport

Russell F. Barker, Hartford
Fern Street Grammar School, West Hartford
Elmwood Elementary School, West Hartford
Alfred Plant Junior High School, West Hartford

Fred'k H. Beckwith, Bridgeport
Wilcoxson Avenue School, Stratford
Central Junior High School, Norwalk
Nichols School, Stratford

Brown & Von Beren, New Haven
Fair Haven Junior High School, New Haven
Simeon Baldwin School, New Haven
Atwater Street Training School, New Haven

Walter P. Crabtree & Son., Hartford
Lincoln Elementary School, New Britain
Federal Hill Elementary School, Bristol
Vocational High School, New Britain

A. Graham Creighton, New London
Hand Academy, Madison
Charles B. Jennings Grammar School, New London
Rutland High School, Rutland, Vt.

R. W. Foote, New Haven
West Haven High School, West Haven
Branford High School, Branford
Silsbey Science Hall, Talladega, Ala.

Thomas M. Freney, Waterbury
Crosby High School, Waterbury
Bunker Hill School, Waterbury
Woodrow Wilson School, Waterbury

George H. Gray, New Haven
Berea College, Berea, Ky.
South Campus: Rogers Hall (Girls' Dormitory); Woods-Penniman Building (Women's Union)
North Campus: Emery Building (Domestic Science); Science Hall; Seabury Gymnasium for Men
East Campus: Agricultural Building

Office of Lorenzo Hamilton, Inc., Meriden
New unit, Roger Sherman School, Meriden
New unit, John Barry School, Meriden
State Trade School, Meriden

William E. Hunt, Torrington
Central Grade School, Winsted
Greenwood School, Winsted
Forbes School, Torrington

Joseph A. Jackson, New Haven
St. Stephen's School, Bridgeport
St. Hedwig's School, Floral Park, N. Y.
St. Stanislaus School, Trenton, N. J.

Wm. D. Johnson, Hartford
Francis Stillman Grammar School, Wethersfield
Holcomb Street Grammar School, Hartford
Third addition, Holcomb Street Grammar School, Hartford

Malmfeld, Adams & Prentice, Hartford
State Trade School, Hartford
West Middle School, Hartford
Brooks School, Andover, Mass.

William T. Marchant, Hartford
Meadow District School, East Hartford
Center School, Farmington
Ridge Road School, Wethersfield

Mylchreest & Reynolds, Hartford
Washington Street School addition, Hartford
Our Lady of Sorrows Grammar School, Hartford
Dormitory, Westminster School, Simsbury

Delbert K. Perry & Earle K. Bishop, New Britain
Science Building and Pathological Laboratory, Connecticut Agricultural College, Storrs
Junior High School, Newington

Ernest A. Southey, Bridgeport
Bassick Junior High School, Bridgeport
Alteration, Beardsley School, Bridgeport
Danbury High School, Danbury

Wm. Thomas Towner, Middletown
Glastonbury Elementary School, Glastonbury
High School, Lakeville
Central School, Middletown

Whiton & McMahon, Hartford
East Hartford High School, East Hartford
Clarence A. Barbour School, Hartford
Hillside Avenue School, Hartford

DELAWARE

E. William Martin, Wilmington
Avongrove High School, Avondale, Pa.
Addition to Unionville School, Unionville, Pa.
Sellersville-Perkasiè High School, Perkasie, Pa.

DISTRICT OF COLUMBIA

Albert I. Cassell, Washington
Howard University group, Washington:
College of Medicine
Gymnasium, Armory and Stadium
Women's Dormitories (group of five buildings)

Albert L. Harris, Municipal Architect, Washington
McKinley High School, Washington
Garnet Patterson Junior High School, Washington
E. A. Paul Junior High School, Washington

Milburn-Heister & Co., Washington
Junior High School, Durham, N. C.
Parochial School, Washington
De LaSalle College, Washington

Rossel Edw. Mitchell, Washington
Methodist Protestant College, High Point, N. C.
High School, Bethesda, Md.
Grade School, Falls Church, Va.

M. F. Moore, Washington
St. Augustine's School, Washington
Bon Secours Convent, Washington
St. Martin's School, Washington

L. P. Wheat, Jr., Washington
Several grade schools and one Junior High School for the Board of Education, Montgomery County, Md.

FLORIDA

Franklin O. Adams, Tampa
Plant High School, Tampa
Brewster Vocational School, Brewster
Henry B. Mitchell Graded School, Tampa

T. M. Bryan, Architect and Acoustical Engineer, Sarasota
Dormitory No. 1, Florida Industrial School for Girls, Ocala
Golf Street Primary School, Sarasota
Nokomis Junior High School, Nokomis

Carpenter & Bent, De Land
Senior and Junior High School, New Smyrna
Seabreeze Elementary School, Daytona Beach
Volusia Avenue Grade School, Daytona Beach

W. M. Christen, Melbourne
High School, Melbourne
Primary School, Melbourne
Elementary School, Melbourne

Frank Dunham, Tampa
N. P. Broward School, Tampa
Oak Park School, Tampa
Federated and Musicale Auditorium, Tampa

M. Leo Elliott, Inc., Tampa
Sarasota Senior High School, Sarasota
Dade City Grammar School, Dade City
Orange Grove Elementary School, Tampa

Edward D. Fitchner, Tallahassee
St. Andrews Grade School, St. Andrews
Bay County High School, Panama City
Jackson County High School, Marianna

C. Frank Galliher, Tampa
Ballast Point Junior High School, Ballast Point
West Shore Junior High School, Port Tampa
Desota Park Grammar School, Tampa

August Geiger, Miami
Shenandoah Junior High School, Miami
Robert E. Lee Auditorium, Miami
Ojus School, Ojus

Mellen C. Greeley, Jacksonville
John Gorrie and Edmund Kirby Smith Junior High School Annex buildings, Jacksonville
Madison High School, Madison
Greenville High School, Greenville

Harry M. Griffin, Daytona Beach
Junior-Senior High School, Daytona Beach
Junior-Senior High School, Leesburg
Junior-Senior High School, Titusville

Arch D. Holsinger, Lakeland
Highlands City School, Highlands City
Grammar School, Haines City
District No. 16 Consolidated School, Kathleen

Bert D. Keck, Stuart
Stuart High and Grade School, Stuart
Indiantown Grade School, Indiantown
High and Junior High School, East Grand Forks, Minn.

Francis J. Kennard & Son, Tampa
Hillsborough High School, Tampa
Memorial Junior High School, Tampa
West Tampa Junior High School, Tampa

Kiehnel & Elliott, Miami
Miami Senior High School, Miami
Group of buildings, Coral Gables Elementary School, Coral Gables
Rollins College, Winter Park, Fla.

Maurice E. Kressly, Orlando
Greensburg Junior-Senior High School, Greensburg, Pa.
Lincoln High School, Ridgeway, Pa.
St. James' Roman Catholic Parish School, Orlando

H. G. Little, Wauchula
Grade School Group, Wauchula
Zolfo School Group, Zolfo
Ft. Meade High School, Ft. Meade

Mark & Sheftall, Jacksonville
Robert E. Lee and Andrew Jackson High Schools, Jacksonville
High and Grade School, Crescent City, Putnam County
Elementary School, Palatka, Putnam County

Elton J. Moughton, Sanford
Seminole High School, Sanford
South Side Primary School, Sanford
Crooms Academy (Negro School), Sanford

H. Hastings Mundy, Miami
Ada Merritt Junior High School, Miami
Dade County Agricultural Senior High School, Miami
Gymnasium, Dade County Agricultural Senior High School, Miami

Howard M. Reynolds, Orlando
Group of three buildings, Orlando Senior High School, Orlando
Group of two buildings, Orlando Junior High School No. 1, Orlando
Group of four buildings, Winter Park Junior-Senior High School, Winter Park

E. L. Robertson & L. R. Patterson, Miami
Auditorium and Cafeteria, Riverside School, Miami
Auditorium and Cafeteria, Highland Park School, Miami
Miami Shores School, Miami

Henry L. Taylor, St. Petersburg
South Side Junior High School, St. Petersburg
Lakeview Avenue Grade School, St. Petersburg
Grade School for Colored Children, St. Petersburg

Nat Gaillard Walker, Fort Myers
Primary and Grade School, Estero
Primary and Grade School, West Fort Myers
Grade and High School, Boca Grande

Rudolph Weaver, Gainesville
Library, Florida State College for Women, Tallahassee
Gymnasium, Florida State College for Women, Tallahassee
Men's Dormitory, University of Florida, Gainesville

S. J. Welch, Pensacola
Jasper High School, Jasper
Milton Grammar School, Milton
Bonifay High School, Bonifay

Walker D. Willis, Pensacola
George Halmark School, Pensacola
Crestview School, Crestview
Tate Agricultural School, Gonzalez

Frank A. Winn, Jr., Tampa
Benjamin Franklin Junior High School, Tampa
Wimauma Elementary-High School, Wimauma
John T. Kenley Elementary School, Uceta

GEORGIA

Cletus W. Bergen, Savannah *
Dining Hall, Georgia State Industrial College, Savannah
49th Street Graded School, Savannah (Consulting Architect)
Florance Street Graded School, Savannah (Consulting Architect)

Edward F. Billie, Atlanta
High School, Fort Valley (Associated with Lockwood and Poundstone)
Auditorium and Gymnasium Wing, Alabama Military Institute, Anniston, Ala.
High School, Live Oak, Fla.

A. Ten Eyck Brown, Atlanta
Newberry High School, Newberry, S. C.
Fullerwood School, St. Augustine, Fla.
Canton High School, Canton

Harold Bush-Brown & J. H. Gailey, Atlanta
Julius Brown Memorial Hall (dormitory), Georgia School of Technology, Atlanta
N. E. Harris Hall (dormitory), same
Dining Hall, same

Wm. J. J. Chase, Atlanta
High and Grammar Schools, Monroe
Rabun Gap-Nacoochee School, Rabun Gap
Moultrie High School, Moultrie

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* See footnote on page 511.

Daniell & Beutell, Atlanta
William A. Russell High School, Fulton County, Atlanta
Marietta High School, Marietta
Sparks-Adel High School, Adel

W. Elliott Dunwody, Jr., Macon
Bruce Grammar School, Macon (Associated with Shelverton & Oliphant)
Law Building, Mercer University, Macon
New group of buildings, Wesleyan College, Macon (Associated with Walker & Weeks, Cleveland, O.)

Edwards & Sayward, Atlanta
Classroom Building, Winthrop College, Rock Hill, S. C.
Columbia Theological Seminary, Atlanta
Girls Senior High School, Atlanta

Hentz, Adler & Shutze, Atlanta
Fulton County High School, Atlanta
School of Commerce and Journalism Building, University of Georgia, Athens
Science Building, Spelman College, Atlanta

Chas. H. Hopson, Atlanta
Clark University, Atlanta
Gammon Theological Seminary, Atlanta
Joel Chandler Harris Grammar School, Atlanta

Willis Irvin, Augusta
Additions and alterations, Girls High School, Augusta
Allendale Centralized School, Allendale, S. C.
William Robinson School, Augusta

Ivey & Crook, Atlanta
Chemistry Building, Emory University, Atlanta
Valdosta Junior College for Men, Valdosta
Druid Hills District School (High and Primary), Decatur

Levy & Clarke, Savannah *
East Side Baldwin Kindergarten, Savannah (Cletus W. Bergen, Associate Architect)
Annex, Waters Avenue School, Savannah (Cletus W. Bergen, Associate Architect)
Florance Street School, Savannah (Cletus W. Bergen, Associate Architect)

T. F. Lockwood, Columbus
Central High School, Phenix City, Ala.
Vocational Building, Industrial High School, Columbus
Group of three buildings, Fitzgerald

Walter P. Marshall, Savannah *
Religious Education School, Savannah
Annex, Waters Avenue School, Savannah
49th Street School, Savannah

Morgan, Dillon & Lewis, Atlanta
Administration Building, Oglethorpe University, Atlanta
Founders Tower Group, same
Lupton and Lowry Halls, same

G. Lloyd Preacher & Co., Inc., Atlanta
Tubman High School for Girls, Augusta
Lanier High School for Boys, Macon
Evans High School, Spartanburg, S. C.

Arthur Neal Robinson, Atlanta
David T. Howard School, Atlanta
Dormitory, Eldridge Academy, Eldridge, Ala.
Rabun Valley High School, Dillard

Scroggs & Ewing, Augusta
Academy of Richmond County and Junior College, Augusta
Monte Sano Grammar School, Augusta

Percy Sugden, Savannah *

Wallin & Comer, Savannah *

HAWAII

C. W. Dickey, Honolulu
New group of buildings, Kamehameha School, Honolulu (Associate Architect)
Girls Industrial School, Oahu
Normal School, Honolulu

Marshall H. Webb, Honolulu
St. Louis College (five buildings), Honolulu
Central Grammar School, Honolulu

* All the public school work in Savannah is handled by the architectural firms in the city belonging to the American Institute of Architects. These firms are: Cletus W. Bergen, Levy & Clarke, Walter P. Marshall, Percy Sugden, Wallin and Comer.

IDAHO

Frank H. Paradice, Jr., Pocatello
Central School, Blackfoot
High School, Blackfoot
Girls' Dormitory, Southern Branch, University of Idaho, Pocatello

Wayland & Fennell, Boise
Administration and Library Building, Pocatello
Administration and Library Building, Albion State Normal School, Albion
High School, Payette

ILLINOIS

Ralph E. Abell Co., Chicago
Palatine Township High School, Palatine
McHenry Community High School, McHenry
Arlington Heights Township High School, Arlington Heights

Aldrich & Aldrich, Galesburg
Alice Ingersol Gymnasium, Canton
Cooke Grade School, Galesburg
Consolidated Grade and High School, Seaton

Aschauer & Waggoner, Decatur
Blessed Sacrament School, Springfield
St. James School, Decatur
St. Thomas School, Decatur

Ashby, Ashby & Schulze, Chicago
J. Sterling Morton High School, Cicero
Leyden Community High School, Franklin Park
John Mills School, Elmwood Park

F. E. Berger & R. L. Kelley, Champaign
Mattoon High School, Mattoon
St. Anne High School, St. Anne
Cerro Gordo High School, Cerro Gordo

Berlin & Swern, Chicago
Dormitories, Beloit College, Beloit, Wis.
Religious Education Building, First Congregational Church, Oak Park

Bradley & Bradley, Rockford
Community High School, South Beloit, Wis.
John W. Henney Grade School, Freeport
Community High School, Stillman Valley

Herbert A. Brand, Chicago
St. Paul's Evangelical Lutheran School, Indianapolis, Ind.
Gymnasium, Concordia Teachers College, River Forest
Dormitory, Evangelical Theological Seminary, Naperville

Brooks, Bramhall & Dague, Decatur
Johns Hill Junior High School, Decatur
Washington Grade School, Decatur
Centennial Junior High School, Decatur

Cervin & Stuhr, Rock Island
High School, Prophetstown
High School and Grade School, Hanover
Stadium, High School, Rock Island

Childs & Smith, Chicago
Haven Intermediate School, Evanston
Jackson High School, Jackson, Mich.
Horace Mann Elementary School, Oak Park

John D. Chubb, Chicago
Senior High School, Quincy (Associate Architect with George P. Behrensmeyer, Quincy)
Maine Township High School, Cook County
Lincoln Junior High School and Boiler House, Kenosha, Wis.

Edwin H. Clark, Inc., Chicago
Ferry Hall, Lake Forest, Ill.
Chicago Latin School, Chicago (Boys; also Girls)
Group of buildings, North Shore Country Day School, Winnetka

S. A. Clausen, Decatur
Mt. Zion Community High School, Mt. Zion
Niantic Community High School, Niantic
Mt. Auburn Community High School, Mt. Auburn

Coolidge & Hodgdon, Chicago
Group of seven buildings, University of Chicago, Chicago
Group of three buildings, St. Olaf College, Northfield, Minn.
Glenbard High School, Glen Ellyn

J. E. Coyle, Joliet
Lockport High School, Lockport
Crete Grade School, Crete
Geneva Grade School, Geneva

S. Lester Daly, Metropolis
Herrin Grade School, Herrin
Gymnasium, Johnston City Township High School, Johnston City
Gymnasium, Metropolis Community High School, Metropolis

Doerr & Doerr, Chicago
Community Junior High School, Blue Island
Evergreen Park Grade School, Evergreen Park
Loretto Academy, Chicago

Hamilton B. Dox, Peoria
Academy of Our Lady (Girls' Catholic High School), Peoria
St. Bernard's Parochial School, Peoria
Franklin School, Peoria

N. Max Dunning, Chicago
Irving School, Maywood (Van Gunten & Van Gunten, Associate Architects)
Stevenson School, Melrose (Van Gunten & Van Gunten, Associate Architects)
Garfield School, Maywood (Van Gunten & Van Gunten, Associate Architects)

George G. Elmslie, Chicago
Forbes Hall of Science, Yankton College, Yankton, S. Dak.
Memorial Chapel, Yankton College, Yankton, S. Dak.
Power-Plant, Yankton College, Yankton, S. Dak.

A. B. Frankel, East St. Louis
Hawthorne Elementary School, East St. Louis
Woodrow Wilson Elementary School, East St. Louis
Junior High School, Litchfield

Hermann J. Gaul & Son, Chicago
St. Michael's High School, Chicago
Sacred Heart Elementary School, Chicago
St. Benedict's Elementary School, Chicago

Paul Gerhardt, Chicago
Lane Technical School, Chicago
Parker Junior High School, Chicago
Austin Senior High School, Chicago

Gill & Jackson, Murphysboro (also St. Louis, Mo.)
Du Quoin Township High School, Du Quoin
Rebuilding—Murphysboro Township High School, Murphysboro
Logan Junior High School, Murphysboro

Leonard Anthony Gliatto, Chicago
Mt. St. Mary's Academy, St. Charles
Our Lady of Perpetual Help, Glenview
Gymnasium, De La Salle Institute, Chicago

Granger & Bollenbacher, Chicago
Women's Memorial Residence Hall, Indiana University, Bloomington, Ind.
Pierce Hall (Men's Union Building), Kenyon College, Gambier, Ohio
Northwestern University Group, Evanston
14 Sorority Buildings
2 Dormitories (with James Gamble Rogers)

Hamilton, Fellows & Nedved, Chicago
Cafeteria wing and Gymnasium, Evanston Township High School, Evanston
Beiger School, Mishawaka, Ind.
Albert Lea High School, Albert Lea, Minn.

Helmle & Helmle, Springfield
Feitshans School, Springfield
Pana Township High School, Pana
St. Mary's Academy, Salt Lake City, Utah

Hewitt, Emerson & Gregg, Peoria
Three Elementary Schools, Aurora
Elementary School, Jacksonville
Township High School, Bradford

Holabird & Root, Chicago
Garrett Biblical Institute, Northwestern University, Evanston
University School for Girls, Chicago
Rosenwald Hall, University of Chicago, Chicago

Holmes & Flinn, Chicago
Carleton College Group, Northfield, Minn.
The McKinley Foundation at the University of Illinois, Champaign
Green Bay Road Elementary School, Highland Park

Horn & Sandberg, Rock Island
Edison School, Rock Island (by firm of Cervin, Horn & Stuhr, now dissolved)
Public School Stadium, Rock Island (partly executed by firm of Cervin, Horn & Stuhr, now dissolved)
Denkman School, Rock Island

Denison B. Hull & Stanley W. Hahn, Chicago
Tanner Library, Illinois College, Jacksonville
Baxter Hall, Illinois College, Jacksonville
Meadville Theological School, Chicago

Robert M. Hyde, Chicago
Lincoln School, Berwyn
Burnham School, Cicero
Midlothian School, Midlothian

J. W. Kennedy, East St. Louis
Collinsville Township High School, Collinsville
Dupo Community High School, Dupo
Freeberg Community High School, Freeberg

Lewis & Dougherty, Chicago
Danville High School, Danville
West Chicago High School, West Chicago
J. H. Freeman Grade School, Aurora

Liese & Ludwick, Danville
Mayo Junior High School, Paris
Community High School, St. Joseph
Community High School, Tuscola

Jos. C. Llewellyn Co., Chicago
Lyons Township High School, La Grange
C. M. Bardwell School, Aurora
York Community High School, Elmhurst

Lundeen, Hooton, Roozen & Schaeffer, Bloomington
Presser Hall (Music School Building), Illinois Wesleyan University, Bloomington
Community High School, Normal
Horatio G. Bent Grade School, Bloomington

Miller & Wallace, Inc., Chicago
Providence High School, Chicago
Health and Physical Education Group, Valparaiso University, Valparaiso, Ind.
Holy Cross Academy, Tucson, Ariz.

Benj. Franklin Olson, Chicago
Rearrangement of campus layout, Elmhurst College, Elmhurst
President's Residence, Elmhurst College, Elmhurst
Gymnasium and Natatorium Building, Elmhurst College, Elmhurst

Oman & Lilienthal, Chicago
School and Parish House, German Evangelical Lutheran Congregation, Chicago
Sigma Delta Tau Sorority House, University of Illinois, Urbana
Sigma Alpha Mu Fraternity House, University of Illinois, Champaign

Charles Pauly & Son, Granite City
George W. Niedringhaus School, Granite City
Marshall School, Granite City
Louis Baer School, Madison

Edgar A. Payne, Galesburg
Consolidated School, Winnebago
Community High School, Durand
Grade and High School, Paw Paw

Perkins, Chatten & Hammond, Chicago
Senior High School, Port Smith, Ark.
Three Elementary Schools, Park Ridge
North Elementary School, River Forest

Peterson & Johnson, Rockford
Theodore Roosevelt Junior High School, Rockford
Abraham Lincoln Junior High School, Rockford
Marengo Community High School, Marengo

L. Pfeiffenberger's Sons, Alton
Alton High School, Alton (Associate Architects with Roger, Danely & Smith)
Marquette High School, Alton
Rufus Easton Grade School, Alton

Pond, Pond, Martin & Lloyd, Chicago
Roger Sullivan Junior High School, Chicago
Clinical Hospital Group, University of Illinois, Chicago
Michigan Union Building, Ann Arbor, Mich.

J. E. O. Pridmore, Chicago
Stickney School, Chicago
College Building, Observatory, Lyceum Building and College Theater, De Paul University, Chicago

George E. Ramey, Champaign
Newman Foundation, Champaign
Lottie Switzer School, Champaign (Berger & Kelley, Associated Architects)
South Side School, Champaign (Berger & Kelley, Associated Architects)

James B. Rezny & Adrian Rezny, Chicago
Assembly Hall and Gymnasium, Saints Cyril and Methodius School, Chicago
St. Marie of Celle Elementary School, Berwyn
Our Lady of the Mount Elementary School, Cicero

Herbert Hugh Riddle, Chicago
Dormitory, Chicago Theological Seminary, Chicago
Hilton Chapel, same
Library and Taylor Hall, same

E. E. Roberts & Elmer C. Roberts, Chicago
Lincoln School, Oak Park
Hawthorne School, Oak Park
Oak Park Baptist Community Center, Oak Park

O. W. Rubach, East St. Louis
Bunsen School, Belleville
Franklin School, Belleville
Washington School, Belleville

Monroe R. Sandel & Co., Chicago
Fournier Institute, Lemont
St. Roman's Parochial School, Chicago
St. Bruno's Parochial School, Chicago

Schmidt, Garden & Erikson, Chicago
College of Pharmacy, University of Illinois, Chicago
St. Mary's Springs Academy for Girls, Fond du Lac, Wis.
Nurses Training School, St. Francis Hospital, Pittsburgh, Pa.

William H. Schulzke, Moline
Junior High School, Moline
Community High School, Erie
Community High School, Geneseo

John A. Scribbins, Chicago
Wallace Junior High School, Sterling
Lincoln Junior High School, Mendota
Libertyville Township High School, Libertyville

Shattuck & Layer, Chicago
Waukegan Junior High School, Waukegan
Washington Grade School, West Harvey
School of St. Thomas the Apostle, Chicago

N. S. Spencer & Son, Chicago
High School, Mt. Vernon, Ind.
Township High School, Merrillville, Ind.
East St. Louis High School, East St. Louis

Leo Strelka, Chicago
St. Hilary's Elementary School, Chicago
St. Eulalia's Elementary School, Maywood
St. Bronislava's Elementary School, Chicago

Leonard F. W. Stuebe, Danvillé
City High School, Kankakee
Tilton Grade School, Danville
Grade and Junior High School, Savanna

John S. Van Bergen, Ravinia
Ravinia Auditorium and School, Highland Park
Braeside School, Highland Park
Chicago Junior School, Elgin

Zook & McCaughey, Chicago
Maine Township High School, Park Ridge
Mt. Prospect School, Mt. Prospect
St. Paul's Lutheran Evangelical School, Mt. Prospect

INDIANA

Austin & Shambleau, South Bend
James Whitcomb Riley Junior High School, South Bend
Senior High School addition to James Whitcomb Riley Junior High School, South Bend
James Madison Junior High and Elementary School, South Bend

Harry Philip Bartlett, Indianapolis
Roosevelt School, Kokomo
Grade School, Seymour
William Street School, Huntington

Carroll O. Beeson, Crawfordsville
Addition to Lebanon High School, Lebanon
Addition to Crawfordsville High School, Crawfordsville
Addition to Darlington School, Darlington

Harry E. Boyle & Co., Evansville
High School, Paoli
High School, Hardinsburg, Ky.
McLeansboro High School, McLeansboro, Ill.

Bradley & Babcock, Fort Wayne
North Webster High and Grade School, North Webster
La Paz High School, La Paz
Bourbon Consolidated School, Bourbon

Everett I. Brown, Fort Wayne
Montpelier Junior High School, Montpelier
P. A. Allen High School, Bluffton
Syracuse High School, Syracuse

Charles H. Byfield, Indianapolis
Grade School No. 85, Indianapolis
Centre Township Grade School No. 3, Indianapolis
District School No. 14, Nora

Robert Frost Daggett, Indianapolis
Lucy Rowland Hall (Girls' Dormitory), De Pauw University, Greencastle
School of Commerce Building, Indiana University, Bloomington
Butler University Group, Indianapolis (Thomas Hibben, Associate Architect)

Willard M. Ellwood, South Bend
High School, Crisman
Junior High School remodeled, South Bend
Boys' Vocational School, South Bend

Foltz, Osler & Thompson, Indianapolis
Newcastle High School, Newcastle
Theodore Potter Fresh Air School, Indianapolis
New group of buildings, Rose Polytechnic Institute, Terre Haute

Fowler & Karges, Evansville
Lincoln High School, Evansville
Henry Ries Grade School, Evansville
St. Vincent School and Orphanage, Vincennes

Freyermuth & Maurer, South Bend
Benjamin Harrison School, South Bend
Abraham Lincoln School, Peru
Greene Township School, St. Joseph County

J. W. Gaddis, Vincennes
High School, Oaktown
High School, Sandborn
Grade and High School, Allendale, Ill.

George & Zimmerman, Indianapolis
Vocational Building, State Normal School, Terre Haute
Valparaiso University Group, Valparaiso
Dormitories, Athens College for Young Women, Athens, Ala.

Henkel & Hanson, Connersville
Jefferson Township, Boone County, School, Dover
Madison High School, Madison
North Manchester Grade School, North Manchester

Norman H. Hill, Indianapolis
East Columbus Grade School, Columbus
Union Township Consolidated School, Johnson County
Taylorsville Consolidated School, Taylorsville

O. L. Hill, Bedford
Ellettsville High School, Ellettsville
Needmore High School, Needmore
Fayetteville High School, Fayetteville

Johnson, Miller, Miller & Yeager, Terre Haute
Woodrow Wilson Junior High School, Terre Haute
Girls' Dormitory, Indiana State Teachers College, Terre Haute
Gymnasium Building, Indiana State Teachers College, Terre Haute

Kervick & Fagan, South Bend
Holy Cross Seminary, Notre Dame
Morrissey Hall, University of Notre Dame, Notre Dame
Lyons Hall, same

McGuire & Shook, Indianapolis
Perry Township School, Indianapolis
School No. 80, Indianapolis
Irvington High School, Indianapolis

Callix E. Miller, South Bend
Holy Cross School, South Bend
Chapel, St. Mary's College, Notre Dame
St. Mary's School, Niles, Mich.

Hubert Miller, Elkhart
Lincoln School, Elkhart
High School, Goshen
Hawthorne School, Elkhart

Karl D. Norris, East Chicago
Roosevelt Junior High School, East Chicago
Lincoln Grade School, Indiana Harbor
La Grange Grade School, La Grange

Wilson B. Parker, Indianapolis
High School, Liberty
Aiken Hall Industrial School, Olive Hill, Ky.
Consolidated School, Kitchel

Wm. Gregory Rammel, Logansport
James Whitcomb Riley Junior High School Group, Logansport
Washington Township Grade and High School, Logansport
Argos High School, Argos

Frank P. Riedel, Lafayette
High and Grade School, Chalmers
Longlois Grade School, Lafayette
St. Ann's Parochial Grade School, Lafayette

R. L. Simons, Elkhart
Dormitory, Hanover College, Hanover
Addition to the Goshen Hospital Training School, Goshen
Albion High School, Albion

Robert W. Stevens, Huntington
St. Felix Capuchin Monastery, Huntington
Central Grade School, Huntington
Dallas Township Consolidated School, Andrews

Geo. J. Stoner & Co., Terre Haute
Glenn High School, East Glenn
North Terre Haute High School, North Terre Haute
Concannon High School, West Terre Haute

Sutton & Routt, Vincennes
St. Mary's School, Washington
Vincennes Gymnasium and Coliseum, Vincennes
LaSalle School, Vincennes

Charles L. Troutman, Evansville
Carpenter Grade School, Evansville
Benjamin Bosse High School, Evansville
Tell City High School, Tell City

Wainwright, Vaughn & Co., Hammond
Technical High School, Hammond
Lincoln Elementary School, Chicago Heights
Junior High School, Chicago Heights, Ill.

E. R. Watkins, Anderson
The Longfellow School, Anderson
St. Mary's School, Anderson
Anderson High School Gymnasium, Anderson

Werking & Son, Richmond
High School, Mays
High School, Milan
High School, Cutler

Joe H. Wildermuth & Co., Gary
Tolleston Primary School, Gary
Public Schools Memorial Auditorium, Gary
Roosevelt Trade School, Gary

IOWA

Charles Altfillisch, Decorah
C. K. Preus Gymnasium, Luther College, Decorah
Theta Xi Fraternity House, Iowa City
Gymnasium, High School, Stanton

Beuttler & Arnold, Sioux City
East Senior High School, Sioux City
High School, Onawa
Public School, Alcester, S. Dak.

Clausen, Kruse & Klein, Davenport
Garfield Elementary School, Davenport
St. Paul's Parochial School, Davenport
Administration Building, Gymnasium, Boiler House for Board of Education, Davenport

Mortimer B. Cleveland, Waterloo
Hawthorne School, Waterloo
Gymnasium, Upper Iowa University, Fayette
Gymnasium, Fletcher College, Oskaloosa

E. O. Damon, Jr., Fort Dodge
St. Mary's School and Convent, Mallard
St. Cecilia's School, Algona
Kamrar High and Grade School, Kamrar

Dougher, Rich & Woodburn, Des Moines
Jefferson Grade School, Muscatine
Senior High School, Marshalltown
Carson Memorial High School, Marengo

Arthur H. Ebeling, Davenport
Maquoketa High School, Maquoketa
Davis Hall, St. Ambrose College, Davenport
St. Joseph's School, Fort Madison

Frank W. Griffith, Fort Dodge
Wahkonsa Grade School, Fort Dodge
Duncombe Grade School, Fort Dodge
Butler Grade School, Fort Dodge

J. Chris Jensen, Council Bluffs
Bloomer School, Council Bluffs
Bartlett School, Bartlett
Henderson School, Henderson

Keffer & Jones, Des Moines
Creston High School, Creston
Indianola High School, Indianola
Bedford High School, Bedford

Raymond F. Moore, Cedar Rapids
High and Grade School, Stronghurst, Ill.
High and Grade School, Ackley
High School, Wayland

Proudfoot, Rawson & Souers, Des Moines
New Medical Group, State University of Iowa, Iowa City
Theodore Roosevelt High School, Des Moines
College buildings, Iowa State College, Ames

Harry E. Reimer, Marshalltown
Garwin High School, Garwin
High School, State Center
High School, Newburg

J. F. Reynolds, Sioux City
Rushville High School, Rushville, Nebr.
Salix High School, Salix
Sargent High School, Sargent, Nebr.

Charles L. Ritts, Burlington
Oak Street Junior High School, Burlington
Addition to Prospect Hill School, Burlington
High School addition, Burlington

George A. Spooner, Council Bluffs
Gymnasium, Abraham Lincoln High School, Council Bluffs
Underwood Consolidated School, Underwood
Sigma Nu Fraternity House, Lincoln, Nebr.

Thorwald Thorson, Forest City
Lake Mills High School, Lake Mills
Akron High School, Akron
Milford Township Consolidated School, Ames

J. C. Wood Co., Clinton
Grade School, Clinton
High and Grade School, Camanche
St. Mary's High School, Clinton

KANSAS

Harry C. Eckland, Kansas City
Iowa Wesleyan College Group, Mt. Pleasant, Ia.
Bethany College Group, Lindsborg
High School, Muscatine, Ia.

Ed Forsblom, Wichita
A. A. Hyde School, Wichita
William Finn School, Wichita
University of Wichita, Wichita

W. E. Glover, Topeka, Kans.
Rural High School, Eskridge
High and Grade Schools, Burlingame
High School, Cottonwood Falls

W. E. Hulse & Co., Hutchinson
Junior College, Hutchinson
Junior High School, Brookfield, Mo.
Senior High School, Hutchinson

Mann & Co., Hutchinson
Senior High School, Dodge City
High School, Bushton
Grade School, Bushton

Routledge & Hertz, Hutchinson
High School, Osborne
Rural High School, Inman
High School, Grinnell

Ralph E. Scamell, Topeka
Boys' Dormitory, Central College, McPherson
High School, Tonganoxie
High School, Lyndon

Schmidt, Boucher & Overend, Wichita
Administration Building, St. John's College, Winfield
Science Hall, Bethel College, Newton
Group of three buildings, Senior High School, Wichita

Chas. W. Shaver, Salina
High School, Brookville
Bartlett Grade School, Salina
High School, Randolph

Smith & English, Hutchinson
Rural High School, Downs
Rural High School, Oxford
Rural High School, Monument

Glen H. Thomas, Wichita
Alcott Elementary School, Wichita
Wichita High School North, Wichita
Senior High School, Coffeyville

S. S. Voigt, Wichita
High School, Medicine Lodge
Grade School, Caldwell
High School, Le Roy

Thos. W. Williamson & Co., Topeka
Central High School, Topeka
Science Hall, Baker University, Baldwin
Field House, Washburn College, Topeka

KENTUCKY

H. A. Churchill & John T. Gillig, Lexington
Gymnasium, Kentucky Wesleyan College, Winchester
Boys' and Girls' Dormitories, Lees Collegiate Institute, Jackson
Hughes Memorial Auditorium, Ashery College, Wilmore

J. Meyrick Colley, Louisville
Western High School for Girls, Louisville
Group of six Junior High Schools, Louisville
Virginia Avenue Elementary School, Louisville

Brinton B. Davis, Louisville
Home Economics Building, School Library and School Dormitory; Western Kentucky State Teachers College, Bowling Green
Stadium and Gymnasium, same
High School, Bardstown

O. W. Holmes, Louisville
Mt. Tabor Grade School, New Albany Township, Floyd County, Ind.
Ohio Falls Grade School, Clarksville, Ind.
Okolona High School, Okolona

C. W. Kimberlin, Owensboro
Thruston Consolidated School, Thruston
Beaver Dam Graded and High School, Beaver Dam
Cloverport High School, Cloverport

Albert F. Klein, Ashland
William C. Condit Grade School, Ashland
John F. Hager Grade School, Ashland
Booker T. Washington Grade School, Ashland

D. X. Murphy & Brother, Louisville
Nine buildings remodeled for the University of Louisville, Louisville
Anchorage School, Anchorage

Thomas J. Nolan, Louisville
St. Cecilia's Parochial Grade School, Louisville
Christ the King Parochial Grade School, Louisville
St. Francis of Rome Parochial Grade School, Louisville

Leo L. Oberwarth & Son, Frankfort
High School and Auditorium, Frankfort
Auditorium and School Building, Institute for Backward Children, Frankfort
Consolidated School, Bagdad

Edgar A. Rassinier, Louisville
Nine buildings remodeled for University of Louisville, Louisville (as member of firm of D. X. Murphy & Brother)
Four buildings, Berea College, Berea (Supervising Architect)
New Building, Anchorage School, Anchorage

G. Tandy Smith, Jr., Paducah
Group of four buildings, Murray State Teachers College, Murray
Andrew Jackson Grade School, Paducah
Grade School, Princeton

Arthur G. Tafel, Louisville
Additions and Gymnasium, Dupont Manual Training High School, Louisville
Evangelical Lutheran School, Louisville
Fern Creek School and Gymnasium, Fern Creek

John T. Waller, Hopkinsville
Bethel Woman's College, Hopkinsville
High School Gymnasium, Hopkinsville
High School, Calhoun

LOUISIANA

William R. Burk, New Orleans
Joseph Maumus School, Arabi
Hope Haven Agricultural and Mechanical School, Marrero
Leon Godchaux High School, Reserve

E. A. Christy, New Orleans
Henry W. Allen Elementary School, New Orleans
Samuel J. Peters Boys High School of Commerce, New Orleans
Charles J. Colton School, New Orleans

Herman J. Duncan, Alexandria
Franklinton High School, Franklinton
Lawtell School, Lawtell
Calvin School, Calvin

Favrot & Livaudais, Ltd., New Orleans
Southwest Louisiana Industrial Institute, Lafayette
Louisiana State Normal College, Natchitoches
Bolton High School, Alexandria

Edward F. Neild, Shreveport
Two High Schools and one Grammar School, Shreveport
One High School, Haynesville
High School, Homer

William T. Nolan, New Orleans
Baton Rouge Senior High School, Baton Rouge
Lafayette Senior High School, Lafayette
St. Joseph's Church Group, Baton Rouge: Boys' High School, teachers' residence, Gymnasium and Auditorium

Theodore L. Perrier, New Orleans
Eighth Ward School, Jefferson Parish
St. Catherine of Sienna Parochial School, Metairie Ridge
Crossman Annex, New Orleans

Martin Shepard, New Orleans
St. Matthias Parochial School, New Orleans
Novitiate Convent, Lafayette
High School Addition, Pascagoula, Miss.

Wogan & Bernard, New Orleans
Jesuit High School Group, New Orleans
Bernard Terrace School, Baton Rouge
Louisiana State University Group, Baton Rouge

C. Scott Yeager, Alexandria
Orange High School, Leesville, Vernon Parish
Pollock High School, Pollock, Grant Parish
Dry Prong High School, Dry Prong, Grant Parish

MAINE

Bunker & Savage, Augusta
Winslow High School, Winslow
Bath High School, Bath
Rockland High School, Rockland

Harry S. Coombs, Lewiston
Skowhegan High School, Skowhegan
M. C. I. Institute, Pittsfield
Lee Academy, Lee

Crowell & Lancaster, Bangor
Mary S. Snow School, Bangor
Dairy Laboratory, University of Maine, Orono
Dormitory for Women, University of Maine, Orono

Miller & Beal, Inc., Portland
Edward Little High School, Auburn
Lawrence High School, Fairfield
North Yarmouth Academy, Yarmouth

MARYLAND

C. M. Anderson, Baltimore
Dining Hall and Science Building, Western Maryland College, Westminster
McDaniel Hall (girls' dormitory), Western Maryland College, Westminster
Baltimore Polytechnic Institute, Baltimore

E. G. Blanke, Baltimore
Our Lady Mt. Carmel Roman Catholic Elementary School, Stemmers Run, Baltimore County
St. Rita's Roman Catholic School, Dundalk
St. John's Roman Catholic School, Baltimore

Buckler & Fenhagen, Baltimore
Baltimore City College, Baltimore
Charles Carroll of Carrollton Elementary School, Baltimore
Pimlico Elementary School, Baltimore

William W. Emmart, Baltimore
Gymnasium, Dickinson College, Carlisle, Pa.
Administration Building, St. Charles College, Baltimore
Northeast Junior High School, Baltimore

W. H. Emory, Jr., Baltimore
Ellicott City High School, Ellicott City (Associated with I. W. Pietsch)
West Friendship School, West Friendship (Associated with I. W. Pietsch)
McDonogh School, McDonogh (Associated with Smith & May)

Clyde N. Friz & Nelson Friz, Baltimore
Windsor Hills School, Baltimore
Hamilton School, Baltimore
Arlington School, Baltimore

Robert Harris, Baltimore
Curtis Bay Vocational School, Baltimore
Elementary School, St. Mary's County
Mechanicsville High School, Mechanicsville

A. A. Hileman, Frederick
Maryland Park High School, Prince George's County
Maryland State School for the Deaf, Frederick
High School, Friendsville, Garrett County

Herbert G. Jory, Baltimore
Elementary School, Baltimore
Nurses Home and Training School, South Baltimore General Hospital, Baltimore
Highlandtown School, Baltimore

Hugh I. Kavanagh, Baltimore
St. Mary's Industrial School, Baltimore
St. John's School, Frederick
Little Flower School, Baltimore

A. J. Klinkhart, Hagerstown
Hagerstown High School, Hagerstown
Fairview Avenue Grade School, Waynesboro, Pa.
Clearspring High School, Clearspring

Mottu & White, Baltimore
Public School No. 69, Baltimore
Donaldson School, Ilchester, Howard County
Friends School, Baltimore

Smith & May, Baltimore
Gwynns Falls Park High School, Baltimore
Entire group, Maryland State Normal School, Salisbury
Forty-five school buildings (total in county), Baltimore County

Upjohn & Glidden, Baltimore
Public School No. 84, Baltimore
Girls' Latin School, Baltimore
St. Catherine's School for Girls, Richmond, Va.

MASSACHUSETTS

Adden & Parker, Boston
Beverly High School, Beverly
Reading Junior High School, Reading
Manter Hall School, Cambridge (Charles H. Way, Associate Architect)

Allen & Collens, Boston (also New York City)
Union Theological Seminary, New York City
Hartford Theological Seminary, Hartford, Conn.
Chapel, Dormitory, Infirmary, Williams College, Williamstown, Mass.

James E. Allen, Lawrence
Lawrence High School, Lawrence
Francis Leahey Elementary School, Lawrence
George W. Brown Elementary School, Newburyport

Andrews, Jones, Biscoe & Whitmore, Boston
Alumnæ Building, Women's College, Brown University, Providence, R. I.
Alpha Delta Phi Fraternity House, Amherst College, Amherst
Stratton Hall (girls' dormitory), Tufts College, Medford

Ashton, Huntress & Alter, Lawrence
James F. Leonard Elementary School, Lawrence
Central Junior High School, Methuen
West Junior High School, Watertown

Elmer Smith Bailey, Boston
Layout of William E. Nickerson Recreation Field: Stadium, Field Houses, Football Dormitory, Boat House, etc., Boston University, Boston
School program for Sanford, Me.: Edison and Lincoln Schools and addition to the High School
School program for Manchester, N. H.: Practical Arts High School, West Side High School, and Franklin Grade School

J. Williams Beal, Sons, Boston
Whitman High School, Whitman
Rockland Junior-Senior High School, Rockland
Hanover Junior-Senior High School, Hanover

Bigelow, Kent, Willard & Co., Inc., Boston
Engineering Building, Rhode Island State College, Kingston, R. I.
Library and Auditorium, same
Armory and Gymnasium, same

Brainerd & Taylor, Boston
Seldon L. Brown School, Wellesley
Six-Grade High School, Peterborough, N. H.
Junior High School, Winthrop

Edwin T. Chapin, Worcester
Lee Street School, Worcester
Andover Street School Addition, Worcester (not yet built)
Addition to High School, Paxton

Office of William Chapman, Boston
Daniel Webster Junior High School, Quincy Point
Adams Shore School, Adams Shore
Merrymount School, Merrymount, Quincy

Coolidge & Carlson, Boston
Indoor Playing Field, Gymnasium and Locker Buildings, Bates College, Lewiston, Me.
Classroom Building and Recreation Building, Girls' School, Berry Schools, Mount Berry, Ga.
Aeronautical Building, Massachusetts Institute of Technology, Cambridge

Coolidge, Shepley, Bulfinch & Abbott, Boston
Medical School, Vanderbilt University, Nashville, Tenn.
Medical School and Hospital, Western Reserve University, Cleveland, Ohio
Fogg Art Museum, Harvard University, Cambridge

Frank Irving Cooper Corp., Boston
Arlington Junior High School, East Arlington
Somerville High School, Somerville
Claremont High School, Claremont

Edward M. Corbett, Fall River
Technical High School, Fall River
Warren High School, Warren, R. I.
Jerome Dwelly Elementary School, Fall River

George A. Cornet, Lynn
Lynn English High School, Lynn
Eastern Junior High School, Lynn
Lynn Trade School, Lynn

Cram and Ferguson, Boston
Chapel, Princeton University, Princeton, N. J.
Three dormitories, Phillips Exeter Academy, Exeter, N. H.
Chapel, St. George's School, Newport, R. I.

John F. Cullen, Boston
School program for city of Fall River, 1927-1930
Frank V. Thompson Junior High School, Boston
Turner's Fall Junior High School, Town of Montague

Cutting, Carleton & Cutting, Worcester
May Street School, Worcester
Sycamore Street Continuation School addition, Worcester
Lincoln Street School, Worcester

Derby, Barnes & Champney, Boston
Hingham High School, Hingham
George Washington Elementary School, Winchester
Bedford Junior High School, Bedford

Alfred O. Dion, Brookline
St. Athanasius School, Rumford, Me.
St. Therese School, Mexico, Me.
Marshfield Junior High School, Marshfield

Ralph Harrington Doane, Boston
Abraham Lincoln School, Braintree
Lincoln Avenue Elementary School, Cliftondale
Sharon High School, Sharon

John William Donahue, Springfield
Providence College, Providence, R. I.
Our Lady of The Elms, College and Academy Buildings, Chicopee
LaSalle Academy, Providence, R. I.

Joseph J. Driscoll, Boston
Continuation School, Boston
Library, St. John's Seminary, Brighton
Champlain Elementary School, Boston

William W. Drummey, Inc., Boston
William McKinley School, Revere
Lafayette School, Everett
Beethoven School (First Standard School), Boston

M. A. Dyer Co., Boston
Municipal Group, Webster: Town Office Building, Senior High School, Junior High School, and Auditorium (one building)
Leominster Junior High School, Leominster
Milton F. Roberts Junior High School, Medford

George H. Fugere & Son, Chicopee Falls
Michael A. Kirby Junior High School, Chicopee
St. George School, Chicopee
Patrick A. Bowe School, Chicopee

E. C. & G. C. Gardner, Springfield
Dormitory and Campus Group, International Y. M. C. A. College, Springfield
Chestnut Street School, Springfield
Junior High School, Stafford Springs, Conn.

Edward T. P. Graham & F. Stillman Fish, Boston (also Cleveland, Ohio)
St. Timothy's School, Garfield Heights, Ohio
Our Lady of Peace School, Cleveland, Ohio
Cathedral Latin School, Cleveland, Ohio

Charles R. Greco, Boston
Cabot Grammar School, Newton
Addition to Lincoln Intermediate School, Melrose
Roberts Intermediate School, Cambridge

Malcolm B. Harding, Westfield
Longmeadow Center School, Longmeadow
Bay Path Institute, Springfield
Consolidated Grade Schools, Southwick

Haven & Hoyt, Boston
Newton Central High School, Newton
New England Conservatory of Music, Boston
Salem Hospital Training School Home for Nurses, Salem

Haynes & Mason, Fitchburg
High School, Springfield, Vt.
Consolidated School, Vineyard Haven
John E. Fitch High School, Groton, Conn.

Henry & Richmond, Boston
Massachusetts School of Art, Boston
Samuel Phillips Recitation Hall and Morse Laboratory of Chemistry, Physics and Biology, Phillips Academy, Andover
Bridgewater State Normal Group, Bridgewater

Hutchins & French, Boston
Henry Whittemore Grade School, Waltham
Group of buildings, Tilton School, Tilton, N. H.
High School, South Berwick, Me.

Thomas M. James Co., Boston
Deering High School, Portland, Me.
Nashua High School, Nashua, N. H.
Berlin High and Junior High Schools, Berlin, N. H.

Paul Beekman Johnson, Springfield
High School addition, Agawam
North Agawam School addition, Agawam
Springfield Street School addition, Agawam

Kilham, Hopkins & Greeley, Boston
Wentworth Institute, Boston
Concord High School, Concord
Alexander Hamilton Junior High School No. 2, Elizabeth, N. J.

J. D. Leland & Co., Boston
Browne School, Watertown
Junior High School, Fitchburg
Junior High School, Worcester

Morris W. Maloney, Springfield
Elias Brookings School, Springfield
Samuel Bowles School, Springfield
Robert O. Morris School, Springfield

George F. Marlowe, Boston
The Bancroft School, Auburn
Frederick Harris School, Springfield
Ludlow High School, Ludlow

McLaughlin & Burr, Boston
Hyde Park High School for Boys and Girls, Boston
Senior High School, Port Washington, Long Island, N. Y.
Walpole High School, Walpole

Maurice P. Meade, Boston
High School, St. Mary of the Assumption Parish, Brookline
Elementary School, St. Bernard's Parish, West Newton
Girls Elementary School, St. Clement's Parish, Medford

Mulhall & Holmes Co., Boston
Ralph Waldo Emerson School, Boston
Charles Logue Elementary School, Boston
Milford Elementary School, Milford

O. E. Nault & Son, Worcester
Assumption College, Worcester
St. Ann's Academy, Marboro
Holy Rosary School, Gardner

Perry, Shaw & Hepburn, Boston
Roxbury Latin School, West Roxbury
New Group for Radcliffe College, Cambridge
Dexter School, Brookline

James H. Ritchie & Associates, Boston
Massachusetts Agricultural College Group, Amherst
High School, Westboro
John Ward School, Newton

Jasper Rustigian, Worcester
Nelson Place School, Worcester
Bloomingdale Road School No. 2, Worcester
Middlesex Avenue School, Worcester

Sanborn & Weed, Lynn
Home-Making School for Girls, Essex County Agricultural School, Hathorne
Cobbett Elementary School and Administration Building (for School Department), Lynn
Tracy Elementary School, Lynn

Office of R. Clipston Sturgis, Boston
Needham High School, Needham
Lawrence School, Brookline
Sudbury School, Sudbury

Matthew Sullivan, Boston
Refectory Building, St. John's Preparatory School, Danvers
St. Thomas' High School, Jamaica Plain, Boston
Our Lady of Grace School, Everett

William Tallman, New Bedford
East Fairhaven Elementary School, Fairhaven
Roosevelt Junior High School, New Bedford
Onset District Elementary School, Wareham

Walker, Walker & Kingsbury, Boston
Washington Irving School, Boston
Washington School, Boston
Michelangelo School, Boston

Edward I. Wilson, Boston
Second unit, Revere Senior-Junior High School, Revere
James A. Garfield Junior High School, Revere
Elementary School, Washington-Allston District, Boston

MICHIGAN

Frank P. Allen & Son, Grand Rapids
Grade and High School, Comstock Park
Grade School, Wyoming Park
Second Ward Grade School, Belding

George J. Bachmann, Flint
Genesee School, Genesee
Bendlecrest School, Flint
Herbert Hoover School, Flint

Ernest S. Batterson, Kalamazoo
High School, Zeeland
Union School, Centreville
Woodrow Wilson School, Kalamazoo

Billingham & Cobb, Kalamazoo
Dowagiac High and Grade School, Dowagiac
Central High School, South Haven
Harding Grade School, Kalamazoo

J. Vanden Bogert, Grand Rapids
Oakleigh School, Grand Rapids
Hudsonville School, Hudsonville
Woodworth School, Grand Rapids

J. N. Churchhill, Lansing
Walter H. French Junior High School, Lansing
Eastern High School, Lansing
Henry R. Pattengill Junior High School, Lansirg

Colton & Knecht, Grand Rapids
St. Thomas' School and Chapel, Grand Rapids
Gymnasium, St. Andrew's Cathedral Parish High School, Grand Rapids
St. Isidore's School, Grand Rapids

Cowles & Mutscheller, Saginaw
School and Auditorium, Swartz Creek
Kinney School, Mt. Pleasant
Daniel Axford Grade School and Auditorium, Oxford

J. Ivan Dise, Detroit
Alexander Hamilton School, Detroit
Christopher Columbus School, Detroit
Thomas A. Edison School, Detroit

Donaldson & Meier, Detroit
Sacred Heart Seminary Group, Roman Catholic Diocese of Detroit
Elizabeth Cleveland Intermediate School (for Board of Education), Detroit
Thomas M. Cooley High School, same

A. H. Ellwood & Son, Kalamazoo
Ligonier High School, Ligonier, Ind.
Hamilton High School, Hamilton, Ind.
Lawrence High School, Lawrence

Frank S. Forster, Muskegon
Junior and Senior High School, Big Rapids
Elementary and Junior High School, Muskegon Heights
Froebel Elementary School, Muskegon

R. V. Gay, St. Johns
Rogers City High School, Rogers City
Carpenter Street Grade School, Midland
McBain High School, McBain

R. S. Gerganoff, Ypsilanti
Woodruff School addition, Ypsilanti
High School Gymnasium, Ypsilanti
Ypsilanti High School addition, Ypsilanti

Joseph C. Goddeyne, Bay City
Immanuel Lutheran School, Bay City
Washington School, Bay City
Woodside School, Bay City

Aaron H. Gould & Son, Detroit
New group of buildings, Wayne County Training School, Northville
Juvenile Detention School, Detroit

George J. Haas, Detroit
Grosse Pointe High School, Grosse Pointe
Lakeview High School, Ste. Claire Shores
South Lake High School, Lake Township

Homer Harper, Benton Harbor
Morton School, Benton Harbor
Bard School, Benton Harbor
Lakeside School, Lakeside

Warren S. Holmes Co., Lansing
National Kindergarten and Elementary College, Evansville, Ill.
New Britain High School, New Britain, Conn.
Marshall High School, Marshall

Derrick Hubert, Menominee
Niagara Junior-Senior High and Grade School, Niagara, Wis.
Ontomagon High School, Ontomagon
Engineering Building, Michigan College of Mining and Technology, Houghton

Albert Kahn, Inc., Detroit
Museums Building, University of Michigan, Ann Arbor
Medical Building, same
Angell Hall, same

Hugh T. Keyes, Detroit
Calvin Coolidge Junior High School, Ferndale
Taft School, Ferndale
Jefferson School, Ferndale

Lane, Davenport & Peterson, Detroit
Ferris Institute, Big Rapids
High School, Clarkston
Wever School, Pontiac

LeRoy & Newlander, Kalamazoo
Central High School, Kalamazoo
Slocum Truax High School, Trenton
High School, Lapeer

Frederick D. Madison, Royal Oak
1927 Royal Oak High School and All-Grade School, Royal Oak
Barnum School, Birmingham
Lapham School, Allen Park

Malcomson & Higginbotham, Detroit
Roosevelt Teachers College Group, Detroit
University of Detroit Group, Detroit
Administration Building, Central State Teachers College, Mt. Pleasant

George D. Mason & Co., Detroit
Charles A. Lindbergh School, Dearborn
Gabriel Richards School, Detroit
Whitmore-Bolles School, Dearborn

McGrath & Dohmen, Detroit
Annie Lathrup School, Birmingham
John Marshall School, Detroit
John A. Logan School, Detroit

Harry L. Mead, Grand Rapids
St. Adalbert's Grade School, Grand Rapids
St. Philip's High School, Battle Creek
Emerson Grade School, Ionia

F. E. Parmelee, Iron Mountain
L'Anse High School, L'Anse
Iron Mountain Junior High School, Iron Mountain
Kingsford High School, Kingsford

Robinson & Campau, Grand Rapids
High School, East Grand Rapids
Grade School, Holland
Seminary, Calvin College, Grand Rapids

Lewis J. Sarvis, Battle Creek
Lakeview Consolidated School, Battle Creek
Fremont School, Battle Creek
Southwestern Junior High School, Battle Creek (J. D. Chubb, Collaborating Architect)

Smith, Hinchman & Grylls, Detroit
Roosevelt High School, State Normal College, Ypsilanti
Mackenzie High School, Detroit
Robert Trombly Elementary School, Grosse Pointe

N. Chester Sorensen, Detroit
Dr. E. L. Shurley Fresh Air School, Detroit
Macomb School, Detroit
John Bagley School, Detroit

Howell Taylor, Detroit
Three grade schools, Adrian
Gymnasium, Adrian College, Adrian

H. H. Turner & V. E. Thebaud, Grand Rapids
Burton Junior High and Elementary School, Grand Rapids
Nelson Elementary and Crippled Children's School, Muskegon
Monroe Junior and Senior High School, Monroe

VanLeyen, Schilling & Keough, Detroit
Fordson High School, Fordson
Birmingham High School, Birmingham
River Rouge High School, River Rouge

B. C. Wetzel & Co., Detroit
Roosevelt High School, Wyandotte
Andrew Jackson Junior High School, Detroit
Holbrook Elementary School, Hamtramck

Albert Wood, Jr., Detroit
James Gardner Grade School, Detroit
Davy Street Grade School, Detroit
Beech Street Grade School, Dearborn

MINNESOTA

W. L. Alban, St. Paul
High and Grade School, Cumberland, Wis.
High School, Blair, Wis.
Lincoln Grade School, Alice Lake, Wis.

Croft & Boerner, Minneapolis
Washington Park High School, Racine, Wis.
Consolidated School, Renville
Junior-Senior High School, Ironwood, Mich.

W. R. Dennis, Fergus Falls
Addition to Fergus Falls High School, Fergus Falls
High and Grade School, Oakes, N. Dak.
St. Mary's Parochial School, Breckenridge

Nairne W. Fisher, St. Cloud (also Dubuque, Iowa)
Clarke College, Dubuque, Iowa
Garfield School, St. Cloud
Mundelien College, Chicago, Ill.

Le Roy Gaarder, Albert Lea
Consolidated Grade and High Schools, Freeborn
Consolidated Grade and High Schools, Alden
New Grade School additions, Albert Lea

F. H. Hafey, Minneapolis
John Marshall High School (for Board of Education), Minneapolis
Washburn Junior High School, same
Maria Sanford Junior High School, same

Hewitt & Brown, Inc., Minneapolis
Dunwoody Institute Group, Minneapolis
Blake School Group, Hopkins
Wayzata Consolidated School, Wayzata

William M. Ingemann, St. Paul
Macalester College Group, St. Paul (Associate Architect)
Dormitory, Gustavus Adolphus College, St. Peter
New group of Dormitory Buildings (designs and floor plans), University of Minnesota, Minneapolis

Jacobson & Jacobson, Minneapolis
Wahpeton School, Wahpeton, N. Dak.
Litchfield School, Litchfield
Anoka School, Anoka

C. H. Johnston, St. Paul
Dormitory for Men, University of Minnesota, Minneapolis
Memorial Auditorium, University of Minnesota, Minneapolis
Physical Education Building, State Teachers College, St. Cloud

B. J. Knowles, Winona
High School Auditorium-Gymnasium, Winona (Associated with Wm. B. Ittner, Inc., St. Louis, Mo.)
St. Thomas Parochial School, Winona
St. Mary's Parochial School, Fountain City

Lang, Raugland & Lewis, Minneapolis (also St. Paul)
New group of buildings, Luther Theological Seminary, St. Paul
School and Dormitory Building, Lutheran Bible Institute, Minneapolis
Grade School for Common School District No. 21, Golden Valley, Hennepin County

Long & Thorshov, Inc., Minneapolis
Concordia College Group, St. Paul; new Campus layout, new Administration Building, and Dormitory
Northwestern Bible School, Minneapolis

P. M. Olsen, Duluth
Cotton High School, Cotton
Cloverdale High School, Cloverdale
Meadowlands School, Meadowlands

Geo. Pass & Son, & P. T. Rockey, Mankato
Franklin Grade and Junior High School, Mankato
Grade School, Fairmont
High School, Blue Earth

Louis C. Pinault, St. Cloud
Grade and High School, Cold Spring
Grade School, St. Joseph
Grade School, Wahpeton, N. Dak.

Albert G. Plagens, New Ulm
St. Anne's Parochial School, Wabasso
Boys' Dormitory, Dr. Martin Luther College, New Ulm
Community Building and High School Gymnasium, Glencoe

C. H. Smith, Duluth
Washburn Grade School, Duluth
Congdon Park Grade School, Duluth
Lincoln Junior High School addition, Duluth

Stebbins, Haxby & Bissell, Minneapolis
Roosevelt School, Richfield
Eden Valley Public School, Eden Valley
Excelsior Junior-Senior High School, Excelsior

J. C. Taylor, Hibbing
Brooklyn Grade School, Hibbing
Parochial Junior High School, Hibbing
Cherry High School, Cherry

Toltz, King & Day, Inc., St. Paul
Dr. Martin Luther College Group, New Ulm
Junior-Senior High School Group, South St. Paul
Washington Grade School, South St. Paul

MISSISSIPPI

Harry North Austin, Jackson
Library, Millsaps College, Jackson
Science Building, Millsaps College, Jackson
Women's Building, Millsaps College, Jackson

Frank P. Gates Co., Jackson
School of Education and Demonstration High School, University of Mississippi
Graduate School Building, University of Mississippi
Law School Building, University of Mississippi

Emmett J. Hull, Jackson
Copiah-Lincoln Junior College, Wesson
Sealman Junior High School, St. Petersburg, Fla.
Newhebron High School, Newhebron

P. J. Krouse, Meridian
High School Building, Natchez
M. S. C. W. Group, Columbus: Dormitory, Dining Hall, Physical Education, Administration
High School, Clarksdale

C. H. Lindsley, Jackson
Home Economics and Hygiene Building, Mississippi State College for Women, Columbus
Agricultural Experiment Station, Agricultural and Mechanical College, Starkville
Administration Building, Delta State Teachers College, Cleveland

Wilfred S. Lockyer, Gulfport
New group of buildings, Harrison-Stone-Jackson Agricultural High School and Junior College, Perkinson, Miss.: Auditorium, Science Department, Boys' Dormitory, Girls' Dormitory, Gymnasium, Power-House, new dining-room and modern kitchen.

Shaw & Woleben, Gulfport
Central Elementary School, Gulfport
Long Beach School, Long Beach
Elementary School, Belzoni

Vinson B. Smith, Jr., Gulfport
Three buildings, Mississippi State Teachers College, Hattiesburg
Two buildings, Industrial Training School, Columbus

J. M. Spain, Jackson
Administration Building, Blue Mountain College, Blue Mountain
Houston School, Houston
Boys' Dormitory, Mississippi College, Clinton

W. A. Stanton, Vicksburg
Carr Junior High School, Vicksburg
Jett and Culkin Vocational Schools, Warren County
Oak Ridge School, Warren County

MISSOURI

Ludwig Abt, Moberly
Gymnasium, Kemper Military School, Boonville
West Park School, Moberly
East Park School, Moberly

Bonsack & Pearce, Inc., St. Louis
Ozark Wesleyan College, Carthage
Hardin College Group, Mexico
High School, Bonne Terre

Walter Boschen, St. Joseph
Neeley School, St. Joseph
Hosea School, St. Joseph
Gymnasium, Northwest Missouri State Teachers College, Maryville

Ernest O. Brostrom, Kansas City
Rock Creek Rural School, Independence
Raytown High School, Raytown
Educational Building, Presbyterian Church, Fort Scott, Kans.

Eckel & Aldrich, St. Joseph
New Central High School, St. Joseph
Two buildings, Missouri State School, Marshall
Group of buildings, Palmer College, Albany

Ben C. Elliott, Mexico
Mexico Junior and Senior High School, Mexico
Bellflower High School, Bellflower
St. Brendan's School, Mexico

Felt, Dunham & Kriehn, Kansas City
Junior High School, Emporia, Kans.
Columbia Elementary School, Joplin
Junior High School, Beatrice, Nebr.

Ferrand & Fitch, St. Louis
Dormitory, Library, and Music Building, Drury College, Springfield
Senior High School, University City (collaborating with Trueblood & Graf)

Frederick C. Gunn, Kansas City
Training School for Nurses, General Hospital, Kansas City
Training School and Clinic No. 2 (colored), General Hospital, Kansas City
Headquarters Building, Church of the Nazarene, Kansas City

Heckenlively & Mark, Springfield
Bolivar High School, Bolivar
Walnut Grove High School, Walnut Grove
Consolidated High School, Anderson

Hellmuth & Hellmuth, St. Louis
Sacred Heart School, Chicago, Ill.
School of the Immaculate Heart, Normandy
School of the Little Flower, St. Louis County

Hoener, Baum & Froese, St. Louis
High School, Jennings
Church School, Cape Girardeau
High School, Owensville

Wm. B. Ittner, Inc., St. Louis
Junior High School, Pontiac, Mich.
Senior High School, Owosso, Mich.
Roosevelt School, Gary, Ind.

Jamieson & Spearl, St. Louis
Biology, Art and Women's Building, Washington University, St. Louis
Law School, University of Missouri, Columbia
Agricultural and Engineering Buildings, University of Arkansas, Fayetteville, Ark.

La Beaume & Klein, St. Louis
Library, Lindenwood College, St. Charles
Washington University School of Dentistry, St. Louis
John Burroughs Country Day School, St. Louis County

Madorie & Bihr, Kansas City
Redemptorist High School, Kansas City
St. Michael's Parochial School, Kansas City
St. Joseph's Parochial School, Kansas City

C. F. McClean, Cameron
Grade School, Cameron
Science Hall, Missouri Wesleyan College, Cameron
Girls' Dormitory, same

R. M. Milligan, St. Louis
Theodore Roosevelt High School, St. Louis
William Beaumont High School, St. Louis
Public Schools' Stadium, St. Louis

Owen, Sayler & Payson, Kansas City
High School, Excelsior Springs
High School, Olanthe, Kans.
Young Hall (Dormitory), Missouri Valley College, Marshall

H. D. Pampel, Kansas City
North Kansas City High School, North Kansas City
Skidmore Grade and High School, Skidmore
Brookfield High and Grade School, Brookfield

L. Baylor Pendleton, St. Louis
Hall of Science, Mayfield College, Lutesville
Girls' Dormitory, same
Baptist Educational Building, Columbia

Reither & Lindsay, Cape Girardeau
Administration Building, Bethel College, McKenzie, Tenn.
High School, East Prairie
High School, Oran

Geo. M. Siemens (successor to Root & Siemens), Kansas City
Rodman Hall (classroom building), St. Marys College, St. Marys, Kans.
Campus plan and College Group, same
Gymnasium and Chapel Building, Kidder Institute, Kidder

Chas. A. Smith, Independence
Westport Junior High School, Kansas City
Administration and Chapel Building, William Jewell College, Liberty
Horace Mann Teachers Training School, Pittsburg, Kans.

Henry C. Smith, Independence
Graceland College Group, Lamoni, Iowa
Kappa Sigma Fraternity House, Lawrence, Kans.
Alpha Chi Omega Sorority House, same

Study & Farrar, St. Louis
Mary Institute, St. Louis County
Teachers Training School, Southeast Missouri State Teachers College, Cape Girardeau
Sappington Grade School, Sappington

H. E. Wagenknecht, St. Joseph
High School, Clarence
High School, Welda, Kans.
Grade School, St. Joseph

MONTANA

Bird & van Teylingen, Great Falls
Great Falls High School, Great Falls
Conrad High School, Conrad
Roosevelt Grade School, Great Falls

J. G. Link, Billings (also Helena)
McKinley School, Butte
Fergus County High School, second unit, Lewistown
Hot Springs High School, Hot Springs, S. Dak.

McIver and Cohagen, Great Falls (also Billings)
Library, University of Montana, Missoula
Library, Normal School, Dillon
High School, Cody, Wyoming

Shanley, Willson & Hugenin, Great Falls (also Butte and Bozeman)
Anaconda Junior High School, Anaconda
Junior and Senior High School, Glasgow
Entomology Laboratory, Hamilton

NEBRASKA

Arthur D. Baker, Grand Island
Senior High School, Grand Island
Clay Center Combination School, Clay Center
Holbrook Combination High and Grade School, Holbrook

George A. Berlinghof, Lincoln
High School, Ashland
High School, Pierce
High School, Panama

N. R. Brigham, Omaha
Pershing Grade and Junior High School, East Omaha
Underwood Grade and Junior High School, Omaha
Monroe Grade School, Omaha

Frederick W. Clarke, Omaha
Sherman School, Omaha
Grade School, Central City
Omaha Technical High School, Omaha (with Edwin B. Clark)

Leo A. Daly, Omaha
New group of buildings, Nebraska School for the Deaf, Omaha
New group of buildings, St. Columban's Preparatory Seminary, near Silver Creek, N. Y.
Faculty Building remodeled and enlarged, Creighton University, Omaha

Davis & Wilson, Lincoln
Field House and Stadium, University of Nebraska, Lincoln
Kearney Junior High School, Kearney
Everett Junior High School, Lincoln

Everett S. Dodds, Omaha
Petersburg Grade and High School, Petersburg
Ralston Public School, Ralston
Elkhorn Grade and High School, Elkhorn

Marcus L. Evans, Hastings
Elementary School, Indianola
Elementary School, Palisade
Elementary School, Culbertson

E. L. Goldsmith & Co., Scottsbluff
Wheatland Grade School, Wheatland, Wyo.
Minatare High School, Minatare
Orleans High School, Orleans

George Grabe, Fremont
Rising City Public School, Rising City
Cedar Rapids Public School, Cedar Rapids
Genoa Public School, Genoa

J. P. Helleberg, Kearney
State Training School, Kearney
Lexington High School, Lexington
Overton High and Grade School, Overton

Lahr & Stangel, Omaha
Notre Dame Academy, Omaha
Howells Public High School, Howells
St. Boniface Grade and High School, Westphalia, Ia.

John Latenser & Sons, Omaha
New group of buildings, Creighton University, Omaha
South High School, Omaha
Shelby Consolidated School, Shelby

Meginnis & Schaumberg, Lincoln
Student Activities Building, Lincoln
Irving Junior High School, Lincoln
Clinton Grade School, Lincoln

J. M. Nachtigall, Omaha
St. Joseph's Grade and Junior High School, Omaha
Duchesne College, Omaha
St. Benedict's Grade School, Omaha

Chas. W. Steinbaugh, Omaha
Washington Grade School, Omaha
High School, Manning, Iowa
Walnut Hill Grade School, Omaha

Jas. C. Stitt, Norfolk
Library, State Normal College, Chadron
Training School, State Normal College, Chadron
Auditorium-Gymnasium, Newman Grove School, Newman Grove

NEVADA

F. J. DeLongchamps, Reno
Educational Building, University of Nevada, Reno
Sparks Junior High School, Sparks
Elko Grammar School, Elko

George A. Ferris & Son, Reno
Las Vegas High School, Las Vegas
B. D. Billinghurst Junior High School, Reno
Austin High School, Austin

NEW HAMPSHIRE

E. T. Huddleston, Durham
University of New Hampshire, Durham:
Hetzel Hall (men's dormitory)
Murkland Hall (classroom building)
Charles James Hall (chemistry building)

Jens Frederick Larson, Hanover
Baker Memorial Library, Dartmouth College, Hanover
Carpenter Fine Arts Building, Dartmouth College, Hanover
Amos Tuck School of Business Administration, Dartmouth College, Hanover

W. Edward Richardson, Dover
Dover High School Annex, Dover
Exeter High School, Exeter
Berwick High School, Berwick, Me.

Wells and Hudson, Hanover
King School, Berlin
Sunapee Central High School, Sunapee
South End Platoon School, Concord

NEW JERSEY

Charles F. Ackerman, Newark
Blessed Sacrament School, Elizabeth
St. Elizabeth's School, Linden
Public School, Essex Fells

Rolf William Bauhan, Princeton
Hun School Group, Princeton
Solebury School Group, New Hope, Pa.
Princeton Preparatory School Group, Princeton

Cornelius V. R. Bogert, Hackensack
Fisher Avenue School, Bogota
Bogota High School, Bogota
State Street School, Hackensack

H. B. Brady, Inc., Elizabeth
Thomas Jefferson Senior High School, Elizabeth
Linden Junior High School, Linden
Theodore Roosevelt School, Cranford

G. W. Brooks, Perth Amboy and Atlantic City
Sacred Heart School, New Brunswick
Our Lady of the Valley School, Orange
Holy Spirit High School, Atlantic City

Clinton B. Cook, Asbury Park
Addition to Toms River School, Toms River
Junior High and Vocational School, Lakewood
Grade School, Island Heights

J. Frederick Cook, Newark
School of Law, St. John's College, Brooklyn, N. Y.
First Avenue School, Newark
St. John's College High School, Brooklyn, N. Y.

Henry Barrett Crosby, Paterson
Grammar School No. 6, Paterson
Grammar School No. 13, Clifton
Grammar School No. 15, Clifton

Arthur E. Doré, Hackensack
Elementary School No. 6, West New York
Elementary and Junior High School No. 4, Hackensack
Elementary School, Westwood

Vincent J. Eck, Red Bank
Red Bank Catholic High School, Red Bank
St. Nicholas' High School, Egg Harbor City
St. Joseph's Parochial School, North Plainfield

Edwards & Green, Inc., Camden
Bridgeton Junior and Senior High School, Bridgeton
Gloucester City High School (for Board of Education), Gloucester City
J. Heulings Coles School (for Board of Education), Delaware Township, Camden County

Fred A. Elsasser, Union
Roselle High School, Roselle
Vaux Hall Grade School, Union
Washington School, Union

Fanning & Shaw, Paterson
Eastside Senior High School, Paterson
Elementary School No. 8, Paterson
Monroe Street Elementary and Junior High School, Ridgewood

The P. L. Fowler Co., Trenton
Bordentown High School, Bordentown
Grammar School No. 1, Florence
Lawrenceville Public School, Lawrence Township, Mercer Co.

Greisen & Tuzik, Perth Amboy
Middlesex County Vocational School No. 2, Perth Amboy
Public School No. 11, Perth Amboy
Clara Barton School, Raritan Township

Guilbert & Betelle, Newark
Columbia High School, South Orange and Maplewood
High School, Great Neck, N. Y.
High School, New Rochelle, N. Y.

Hacker & Hacker, Fort Lee
Teaneck High School, Teaneck
Dumont High School, Dumont
Lindberg School, Palisades Park

Hill & Gollner, Trenton
Public School, Williamstown
Witherspoon Street School, Princeton
Grade School, Aura

John F. Kelly, Passaic
Passaic Memorial School, Passaic
Public School No. 1, Passaic
Public School No. 12, Passaic

Lackey & Hettel, Camden
Camden County Vocational School, Pensauken Township
Philadelphia College of Osteopathy, Philadelphia, Pa.
South Jersey Law School, Camden

Lucht & Anderson, Cliffside Park
Presbyterian Church School, Leonia
Trinity Evangelical Lutheran Church School, Hudson Heights
Swedish Evangelical Mission Church School, West New York

Wm. Mayer, Jr., West New York
Memorial High School, West New York
Public School No. 1, West New York
Public School No. 5, Cliffside Park

Arnold H. Moses, Camden
Audubon High School, Audubon
Pensauken Junior High and Grade School, Pensauken Township
Merchantville High School, Merchantville

John Noble Pierson & Son, Perth Amboy
New Market School, Piscataway Township
Somerville School, Somerville
Barnegat High School, Barnegat

C. Godfrey Poggi & William B. Bragdon, Elizabeth
Public School No. 8, Hillside
Junior High School, Dunellen
St. Michael's Parochial School, Cranford

F. Herbert Radey, Camden
Thomas Sharpe School, Collingswood
Stratford School, Stratford
Mantua School, Mantua

Ernest Sibley & Lawrence C. Licht, Palisade
High School, Princeton
High School, Orange
School for District No. 1 and Owen D. Young, Van Hornesville, N. Y.

Simpson & Rolston, Inc., Newark
Buckley School (private), Greenvale, N. Y.
Buckley School (private), Rumson
High School, Mechanicville, N. Y.

Wm. W. Slack & Son, Trenton
Lincoln Elementary and Intermediate School, Trenton
Junior High School, Oxford Furnace
Rider College, Trenton

John C. Van Vlandren, Paterson
Public School No. 20, Paterson
Memorial School, Totowa
Eastern Academy, Paterson

A. L. Vegliante, Garfield
Midland School No. 1, Midland Township
Monastery and School, Italian Capuchin Fathers, Bronx, N. Y.
Church and School, Our Lady of Mount Carmel R. C. Church, Passaic

Jacob J. Vreeland, Dover
Lincoln School, Rockaway
Denville School, Denville Township
Blairstown School, Blairstown Township

Fred Wesley Wentworth, Paterson
School No. 13, Paterson
Wayne School, Wayne Township
Monroe High School, Monroe, N. Y.

NEW MEXICO

Gaastra & Gladding, Albuquerque (also Santa Fe)
Eugene Field Grade School, Albuquerque
University of New Mexico Group, Albuquerque: Biological Building, Gymnasium, Lecture Hall and Dormitory
Grants Union High School, Grants

George Williamson, Inc., Albuquerque
Manual Arts-Albuquerque High School, Albuquerque
New Mexico School of Mines, Socorro
Spanish-American Normal School, El Rito

NEW YORK

Carl C. Ade, Rochester
Waterloo High School, Waterloo
Watkins Glen High School, Watkins Glen
Bolivar High School, Bolivar

Associated Buffalo Architects, Inc., Buffalo
Lewis J. Bennett High School, Buffalo
Public School No. 31, Buffalo
Public School No. 71, Buffalo

E. G. Atkinson, Schenectady
Greenport School, Greenport,
Central School, District No. 1, Lebanon Springs
Van Antwerp School, Niskayuna

Bagg & Newkirk, Utica
Biology-Geology Laboratories, Hamilton College, Clinton
Chemistry Building, Hamilton College, Clinton
Roosevelt School addition, Utica

William J. Beardsley, Poughkeepsie
Governor George Clinton School No. 8, Poughkeepsie
Glen Cove School, Glen Cove
S. F. B. Morse School No. 5, Poughkeepsie

Edward J. Berg, Utica
Our Lady of Lourdes Parochial School, Utica
Parochial School for Church of The Annunciation, Ilion
St. Mary's Parochial School, Oneonta

Wesley Sherwood Bessell, New York City
Mount Vernon Seminary, Washington, D. C.
Public School, Port Washington
Public School, Freeport

Gerard W. Betz, Kingston
Grade and High School, Walden
Grade School, Glasco
High School and Manual Training Building, Kingston

Frank H. Bissell, New York City
St. Gabriel's School, New Rochelle
Roger Ludlow Junior High School, Norwalk, Conn.
Rye Neck High School, Mamaroneck

Bley & Lyman, Buffalo
Canisius College Group, Buffalo
Lackawanna High School, Lackawanna
Harding School, Kenmore

R. L. Bowen, Schenectady
Mt. Pleasant High School, Schenectady
Oneida Intermediate School, Schenectady
Euclid Elementary School, Schenectady

A. L. Brockway, Syracuse
Elmwood Grade and Grammar School (including auditorium and gymnasium), Syracuse
Le Moyne Grade and Grammar School (including auditorium and gymnasium)
Syracuse Central High School, Syracuse

Frank Burkhard, New York City
Nativity School, Poughkeepsie
St. Joseph's School, New York City
Villa Maria Academy, The Bronx, New York City

Charles A. Carpenter, Rochester
Phelps Union and Classical School, Phelps
Departmental Church School, Christ Episcopal Church, Poughkeepsie
Departmental Church School, First Methodist Episcopal Church, Lockport

George Cary, Buffalo
Buffalo Historical Building, Buffalo
Medical and Chemistry Departments, University of Buffalo, Buffalo
Dental College, same

G. Howard Chamberlin, Yonkers
Nathaniel Hawthorne Junior High School, Yonkers
Benjamin Franklin School, Yonkers
Longfellow School, Yonkers

Walter B. Chambers, New York City
Bingham and McClellan Halls (dormitories), Yale University, New Haven, Conn.
Lawrence Hall (lecture) and Stillman Hall (dormitory), Colgate University, Hamilton
McGregory Hall (Chemistry Laboratory), Colgate University, Hamilton

Carl W. Clark, Cortland
Massena Grade School, Massena
Warners High School, Warners
Gilboa Central School, Gilboa

Coffin & Coffin, New York City
Saratoga Springs High School, Saratoga Springs
Group of buildings, El Instituto Ingles, Santiago, Chile
Two Elementary Schools, Greenwich, Conn.

Conable, Smith & Rowley, New York City
Administration Building, Lecture Halls and Dormitory, Wagner College, Staten Island
Cortland High School, Cortland
North Side School, East Williston

Conrad & Cummings, Binghamton
Benjamin Franklin School, Binghamton
Alexander Hamilton School, Binghamton
West Corners School, Union

Cook & Blount, New York City (Associated with Lockwood Greene & Co., Inc.)
Frank Evans High School, Spartanburg, S. C.
Field House and Gymnasium, Yale University, New Haven, Conn.
Girls' Dormitory and Dining Hall, Bucknell University, Lewisburg, Pa.

Corbett, Harrison & MacMurray, New York City
Far Rockaway High School, New York City (Associate Architects)
DeWitt Clinton High School, New York City (Associate Architects)
Theodore Roosevelt High School, New York City (Associate Architects)

Crow, Lewis & Wick, New York City
Sage Engineering Building, New York University, New York City
School of Aeronautics, same
Library Building, College of the City of New York, New York City

Howard F. Daly, Amsterdam
Junior High School, Amsterdam
Senior High School, Amsterdam
Clizbe Avenue Grade School, Amsterdam

R. H. Dana, Jr., New York City
New building for the Dalton Schools, Inc., New York City
St. Margaret's School, Waterbury, Conn.
Group of five buildings, Gunnery School, Washington, Conn.

Delano & Aldrich, New York City
Recitation Building, Lawrenceville School, Lawrenceville, N. J.
Sterling Chemistry Laboratory, Yale University, New Haven, Conn.
Music School, Smith College, Northampton, Mass.

Dennison & Hirons, New York City
Beaux Arts Institute of Design, Beaux Arts Society, New York City
Rye County Day School, Rye
Valley Stream School, Valley Stream

DePace & Juster, New York City
Mt. Carmel School, Elmsford
Loretta School and Center, New York City
R. C. Orphanage and School, Gladstone, N. J.

Dietel & Wade, Buffalo
St. Thomas Aquinas School, Buffalo
Orphan Asylum School, Buffalo
Christ the King School, Buffalo

O. W. & H. B. Dryer, Rochester
Fairport High School, Fairport
Honeoye Falls New Grade and High School, Honeoye Falls
Durand Eastman Grade Unit, Irondequoit

Raymond A. Freeburg, Jamestown
High School, Celeron
High School, Hilton
Junior and Senior High School, Falconer

Joseph E. Fronczak, Buffalo
Villa Maria Academy and Convent, Buffalo
Our Lady of Czestochowa Parochial School, Cheektowaga
St. Stanislaus Kostka Elementary School, Rochester

Fuller & Robinson Co., Albany
Albany Law School, Albany
Franklin Academy, Malone
Walter A. Wood High School, Hoosick Falls

August Henry Galow, Huntington
Lincoln School, Huntington Station
Franklin Square School, Hempstead
Central School, South Huntington

Clarence H. Gardinier, Albany
New Quadrangle Group and Faculty Houses, St. Stephen's College, Annandale-on-Hudson
High and Grade School, Schuylerville
High and Grade School, Kinderhook

Arthur N. Gibb, Ithaca
Henry St. John School, Ithaca
Ludlowville High School, Ludlowville
Junior High School, Ithaca

Archibald F. Gilbert, New York City
Lowville Academy and Grade School, Lowville
Alexandria Bay Grade and High School, Alexandria Bay
Granville High School, Granville

Thomas L. Gleason, Albany
Schoharie High School, Schoharie
Public School No. 27, Albany
Addition, Public School No. 23, Albany

Wm. H. Gompert, New York City
New York Training School for Teachers, New York City
DeWitt Clinton High School, New York City
Theodore Roosevelt High School, New York City

Goodwillie & Moran, New York City (also Montclair, N. J.)
Central Grade School, Glen Ridge, N. J.
Linden Avenue School, Glen Ridge, N. J.
Memorial Parish School, Orange, N. J.

Gordon & Kaelber, Rochester
New group of twelve buildings, Mens College, University of Rochester, Rochester
Benjamin Franklin High School, Rochester
Meharry Medical College, Nashville, Tenn.

Robert R. Graham, Middletown
Liberty Street Grade School, Middletown (D. H. Canfield, Associate Architect)
Florida High and Grade School, Middletown
Central Valley Junior High and Grammar School, Central Valley

Edw. B. Green & Sons—A. H. Hopkins, Buffalo
Kibler High School, Tonawanda
Nichols Country Day School for Boys, Buffalo
Brooklyn Avenue School, Union Street School, and Hutchins-South Jackson Streets School, Batavia

Edward Hahn, Hempstead
Mamaroneck High School, Mamaroneck
Floral Park-Bellrose Grade and Junior High School, Floral Park-Bellrose
Sunrise Park School, Wantagh

Earl Hallenbeck, Syracuse
Liverpool High School, Liverpool
Canastota High School, Canastota
Sandy Creek High School, Sandy Creek

Haskell & Considine, Elmira
Horseheads Junior and Senior High School, Horseheads
School for District No. 6, Elmira
Public School No. 4, Elmira

I. Edgar Hill, Geneva
Dormitory Building, Hobart College, Geneva
High School, Andover
Coxe Hall, Hobart College, Geneva

John Mead Howells, New York City (originally Howells & Stokes)
Pratt Auditorium, Brooklyn
Science and Technology Building, Pratt Institute, Brooklyn
Chapel and dormitories, Wooster School, Danbury, Conn.

Paul Hueber, Syracuse
Blessed Sacrament School, Syracuse
St. Brigiol's School, Syracuse
St. Mary's School, Rome

Paul F. Jagow, Lynbrook
Lynbrook Grade School, Lynbrook
Lakeview Grade School, Malverne
Rhame Avenue Grade School, East Rockaway

Louis Jallade, New York City
Grade School, Scarsdale
Summer Training School Group, Blue Ridge, N. C.
Gymnasium, Union Theological Seminary, New York City

Oliver R. Johnson, Jamestown
Lakewood High School, Lakewood
Westfield High School addition, Westfield
Vocational School, No. 10, Dunkirk

William H. Jones, Yonkers
Parochial School for the Parish of St. Denis, Yonkers
Church and School of the Blessed Sacrament, The Bronx, New York City
Parochial School of Saint Margaret, The Bronx, New York City

L. J. Kaley, Binghamton
Hooper School addition, Endwell
Christopher Columbus School, Binghamton (Associate Architect)
Addition to Woodrow Wilson School, Binghamton

F. J. & W. A. Kidd, Buffalo
East High School, Buffalo
Riverside High School, Buffalo
Kenmore High School, Kenmore

Office of D. D. Kieff, Watertown
West Carthage High School, Carthage
Edwards High School, Edwards
Massena School, Massena

Beverly S. King, New York City
Administration Building, Lincoln College, Lincoln, Ill.
Science Hall, Lincoln College, Lincoln, Ill.
The Pingrey School, Elizabeth, N. J.

Melville L. King, Syracuse
Solvay High School, Solvay
East Syracuse High School, East Syracuse
Continuation School, Syracuse

Kinne & Frank, Utica
Grade School, Oneonta
Lyons Falls High School, Lyons Falls
Canajoharie High School, Canajoharie

Frank W. Kirkland, Rome
Columbus Grade School, Rome
DeWitt Clinton Grammar and Grade School, Rome
Forestport Union Free School, District No. 10, Forestport

Kirkpatrick & Cannon, Niagara Falls
Trott Vocational School, Niagara Falls
Niagara University Group, Niagara Falls: Dormitory Group, Gymnasium

Knappe & Morris, New York City
Stamford High School, Stamford, Conn.
St. Teresa's Parochial School, North Tarrytown
Hendrick Hudson High School, Montrose

A. Lawrence Kocher, New York City
Grade School, Pennsylvania State College, State College, Pa.
Dairy Barn, same
Grade School, Berwick, Va.

A. T. Lacey & Son, Binghamton
East Junior High School, Binghamton
Addition to High School, Endicott
West Junior High School, Binghamton

W. W. La Chance, Niagara Falls
17th Street Public School, Niagara Falls
Ferry Avenue Public School, Niagara Falls
Center Avenue Public School, Niagara Falls

William I. La Fon, Jr., Southampton
Southampton High School, Southampton
Eastport High School, Eastport
Bellport Grade School, Bellport

Lansing & Greene, Watertown
South Junior High School, Watertown
North Junior High School, Watertown
Potsdam High School, Potsdam

Simon Larke & Russell G. Larke, Niagara Falls
Hyde Park Grade School, Niagara Falls
Also schools in association with others, cooperating as Associated Architects of Niagara Falls

Lee & Hewitt, New York City (also Paterson, N. J.)
Additions, Clifton High School, Clifton, N. J.
Tenakill School, Closter, N. J.
Trenton Avenue School, Paterson, N. J.

Electus D. Litchfield, New York City
Macalester College Group, St. Paul, Minn.: General Group Plan for future development; Boys' Dormitory, Gymnasium, and Power-House

George F. Lorenz, Rochester
St. Boniface School, Rochester
St. John the Baptist School, Lockport
Holy Trinity School, Webster

Edward W. Loth, Troy
St John's Parochial Academy, Rensselaer
St. John's Parochial Junior High School, Rensselaer
Public School No. 12, Troy

Oscar Lowinson, New York City
Marion Street School, Lynbrook
Atlantic Avenue School, Lynbrook
Uniondale School No. 2, Uniondale

Ludlow & Peabody, New York City
Two buildings, Wilson College, Chambersburg, Pa.
Science Building, Hampton Institute, Hampton
President's House, Stevens Institute, Hoboken, N. J.

Henry J. McGill & Talbot F. Hamlin, New York City
Brescia Hall (dormitory) and Science Hall, College of New Rochelle, New Rochelle
School, Convent and Parish Hall, Saints Simon and Jude's R. C. Church, Brooklyn
Ursuline School for Girls (Academy), New Rochelle

W. Philip McGovern, New York City
St. Francis' College, Brooklyn
St. Mark's School, Sheepshead Bay
Resurrection School, Gerrittsen Beach

McKenna & Irving, New York City
St. Clement's Parochial School, South Ozone Park
Brooklyn Preparatory High School, Brooklyn
Our Lady of Victories Parochial School, Jersey City, N. J.

McKim, Mead & White, New York City
Harvard Business School, Boston, Mass.
Olin Memorial Library, Wesleyan College, Middletown, Conn.
Chemistry Building, Columbia University, New York City

E. P. Mellon, New York City (also Pittsburgh, Pa.)
Group of buildings, Shady Side Academy, Pittsburgh, Pa.
Group of buildings, Pennsylvania College for Women, Pittsburgh, Pa.
Memorial Library, Choate School, Wallingford, Conn.

Henry Killam Murphy, New York City
Hopkins Grammar School, group of new buildings, New Haven, Conn.
Yenching University group of new buildings, Peking, China
Ginling College group of new buildings, Nanking, China

Murphy and Lehmann, Brooklyn
St. Agnes' Seminary, Brooklyn
Resurrection School, Rye
Our Lady of Guadalupe School, Brooklyn

Leland Henry Niles, Amsterdam
Vrooman Avenue School, Amsterdam
Fifth Ward School, Amsterdam
District No. 2 School, Amsterdam

James W. O'Connor, Architect; **James F. Delany & Paul Schulz,** Associates, New York City
Complete group, Manhattan College, New York City
La Salle Military Academy, Oakdale
Complete group, All Hallows Institute, New York City

Gerald Jos. O'Reilly, New York City
Citrus Grove Grade School, Miami, Fla.
Lemon City Agriculture and Trade High School, Miami, Fla.
Larkin Public School—Little River Public School, Larkin, Fla.

Peabody, Wilson & Brown, New York City
Westbury High School, Westbury
Grade School, Cold Spring Harbor
Grade School, Woodbury

Pember & Demers, Albany
Utica Country Day School, New Hartford
St. Agnes School, Albany
West Rutland High School, West Rutland, Vt.

Pierce & Bickford, Elmira
South Side High School, Elmira
Elm Street School, Waverly
Cook Academy Gymnasium, Montour Falls

Chester R. Phelps, Niagara Falls
North Junior High School, Niagara Falls
Niagara Street School, Niagara Falls
Lewiston Grade and High School, Lewiston

Charles A. Platt, New York City
Library, University of Illinois, Urbana, Ill.
Architectural Building, same
George Washington Hall, Phillips Academy, Andover, Mass.

Cyrus K. Porter & Sons, Buffalo
Foster Hall, University of Buffalo, Buffalo (McKim, Mead & White, Associate Architects)
Edmund Hayes Hall, University of Buffalo, Buffalo
17th Street School, Niagara Falls

Wilson Potter, New York City
High School, Peekskill
High School, Geneva
High School, Oneida

Randall & Vedder, Syracuse
Danforth Grade and Normal School, Syracuse
Washington Irving Grade School, Syracuse
Seymour Grade School, Syracuse

Rasmussen & Wayland, New York City
Bernardsville High School, Bernardsville, N. J.
Allendale Grade School, Allendale, N. J.
Wilson Borough Junior-Senior High School, Easton, Pa.

Victor Reeser, Inc., New York City
Group of buildings, St. Joseph's School for the Instruction of the Blind, Jersey City, N. J.:
School and Home for Adults
School and Dormitory for Boys
School and Dormitory for Girls

Robert J. Reiley, New York City
St. Joseph's Academy, Brentwood
Immaculate Conception Seminary, Huntington
Holy Trinity School, Mamaroneck

Marcus T. Reynolds; Kenneth C. Reynolds, Associate, Albany
School Four, Albany
William I. Hackett Junior High School, Albany
Albany Academy Group, Albany

Ralph M. Rice, New York City
West Street Grade School, Newburgh
Chestnut Street School, Newburgh
Addition to Beacon High School, Beacon

James Gamble Rogers, New York City
Northwestern University Group, Chicago, Ill.
Harkness Memorial, Yale University, New Haven, Conn.
Sterling Memorial Library, same

Palmer Rogers, New York City
Northside High School, Corning
High School and Grade School, Addison
High School and Grade School, Sidney

Rossiter & Muller, New York City
Foxmeadow Grade School, Scarsdale
Scarsdale High School, Scarsdale
Edgewood School, District No. 1, Scarsdale

William L. Rouse, New York City
School and Settlement House, Federation Settlement House, New York City
School and Settlement House, The Madison House, New York City
Addition to Hebrew Technical Institute, New York City

J. M. Ryder, Schenectady
Scotia High School, Scotia
St. Johnsville High School, St. Johnsville
Stillwater High School, Stillwater

Salvati & LeQuornik, Brooklyn
St. Clare Parochial School, New York City
Our Lady of Mt. Carmel Parochial School, Mt. Vernon
Mary Help of Christians School, New York City

Francis R. Scherer, Rochester
Lexington School No. 34, Rochester
Abelard Reynolds School No. 42, Rochester
Frank Fowler Dow School No. 52, Rochester

A. F. A. Schmitt, New York City
Immaculate Conception School, New York
St. Pius School, New York City
Capuchin College, Garrison

A. W. E. Schoenberg, Olean
Ellicottville High School, Ellicottville
Richburg High School, Richburg
Belmont High School, Belmont

Frederick J. Schwarz, New York City
St. Joseph's Roman Catholic School, Bayonne, N. J.
Holy Trinity School, Yonkers
Holy Rosary Roman Catholic School, Passaic, N. J.

Alexander Selkirk, Albany
Albany College of Pharmacy, Albany
Public Grade and High School, Delmar
Public Grade School No. 23, Albany

Albert M. Skinner, Watertown
Cooper School, Watertown
Washington and Lincoln Schools, Ogdensburg
Sacket Harbor High School, Sacket Harbor

Edward C. Smith, Poughkeepsie
Christopher Columbus Grade School (Public School No. 3), Poughkeepsie
Warring Grade School (Public School No. 10), Poughkeepsie
Grade and High School, Arlington

Howard Leland Smith, New York City
West End School, Long Beach
East End School, Long Beach
Park Street School, Long Beach

Frank A. Spangenberg, Buffalo
Seneca Vocational School, Buffalo
Hamburg High School, Hamburg
Grade and High School, Clifton Springs

W. H. Spaulding, Jamaica
Grade School, Union Free School District No. 27, West Hempstead
Grade School, Union Free School District No. 16, Elmont
Grade School, Union Free School District No. 30, Valley Stream

Starrett & Van Vleck, New York City
White Plains High School, White Plains
Isaac E. Young Junior High School, New Rochelle
Eastview Junior High School, White Plains

Philip Steigman, Brooklyn
Yeshiva D'Brooklyn (High School and College), Brooklyn
Yeshiva Torah Vo-Daath (High School and College), Brooklyn
Yeshiva Isaac Jacob Reiners (High School and College), Brooklyn

Gustave E. Steinback, New York City
St. Joseph's College for Women, Brooklyn
St. Benedict's School, New York City
Quigley Memorial Seminary, Chicago, Ill. (Joseph W. McCarthy, Associate Architect)

Stoughton & Stoughton, New York City (also Winnipeg, Canada)
Polytechnic Institute of Porto Rico, San German, P. R.:
Girls' Dormitory
Boys' Dormitory
Commons

Herbert C. Swain, Buffalo
Eden High School, Eden
Silver Springs High School, Silver Springs
Newfane High School, Newfane

Thomas & Baker, New York City
Auditorium, Albany Teachers College, Albany
Buffalo Teachers College, Buffalo
Students' Classroom Building, Albany Teachers College, Albany

Thompson, Holmes & Converse, New York City
New group of buildings, Hunter College of the City of New York, New York City
School of Business, College of the City of New York, New York City
Dalton High School, Dalton, Mass.

Edward Lippincott Tilton, New York City
Welch Medical Library, Johns Hopkins University, Baltimore, Md.
Johnstown School, Johnstown, Pa.
Caflisch Memorial Hall, Allegheny College, Meadville, Pa.

Tooker & Marsh, New York City
High School, Oyster Bay
High School, Pleasantville
High School, Ticonderoga

Wm. B. Tubby, New York City
Roslyn High School, Roslyn
Roslyn Grade School, Roslyn
Bedford Junior High School, Westport, Conn.

Hobart B. Upjohn, New York City
Group of eight buildings, North Carolina State College, Raleigh, N. C.
Group of five buildings, St. Catherine's School for Girls, Richmond, Va.
Two dormitories, Salem College, Winston-Salem, N. C.

E. P. Valkenburgh, Middletown
Albert Street Grade School, Middletown
Warwick High School, Warwick
South Fallsburg High School, South Fallsburg

W. Brown Van Dreser, Gloversville
New Junior High School, Gloversville
Speculator District School, Speculator
Wells District School, Wells

John V. Van Pelt, New York City
Gennadeion Library Group, American School of Classical Studies in Athens (Associate Architect)
School and Convent, Church of the Immaculate Conception, Tuckahoe
Convent, Church of the Holy Innocents, Pleasantville

Robert P. Vignola, Harrison
Silver Lake Grade School, Harrison
Halstead Avenue School, Harrison
Purchase Grade School, Harrison

Theodore Visscher & James Burley, New York City
James Ward Packard Laboratory of Electrical and Mechanical Engineering, Lehigh University, Bethlehem
University Library, Lehigh University, Bethlehem
Science Building, Hampden-Sidney College, Hampden-Sidney, Va.

C. Edward Vosbury, Binghamton
Johnson City High School, Johnson City
Theodore Roosevelt School, Johnson City
Palm Harbor School, Clearwater, Fla.

J. Foster Warner, Rochester
Aquinas Institute of Rochester, Rochester
Blessed Sacrament School, Rochester
Holy Family School, Auburn

Harold H. Werner, New York City
William Wilson Jr. School No. 6, Mt. Vernon
Mount Vernon High School addition, Mt. Vernon
De Witt Clinton School No. 9 addition, Mt. Vernon

John C. Westervelt, New York City
Laboratory and Greenhouses, Plant Industry Building, and Library Building (not yet built), New York State College of Agriculture, Cornell University, Ithaca

H. Herbert Wheeler, New York City
Chi Psi Lodge, New Haven, Conn.
Chi Psi Lodge, Middlebury, Vt.
Chi Psi Lodge, Middletown, Conn.

J. Russell White, Albany
Grade and High School, Bolton Landing
Indian Lake Central School, Indian Lake
Grade and High School, Middleville

Frederic P. Wiedersum, Valley Stream
Valley Stream High School, Central High School District No. 1, Valley Stream
Malvern Grade School, Valley Stream
Union Free School, District No. 24, Valley Stream

NORTH CAROLINA

Atwood and Nash, Inc., Chapel Hill
Library, University of North Carolina, Chapel Hill
Commerce Department Building, University of North Carolina, Chapel Hill
Library and Dormitory, Peace Institute, Raleigh

Harry Barton, Greensboro
Senior High School, High Point
Auditorium, North Carolina College for Women, Greensboro
Music Building, North Carolina College for Women, Greensboro

Benton & Benton, Wilson
Selma Public School, Selma
High School, Tarboro
Fremont Public School, Fremont

G. R. Berryman, Raleigh
Seven buildings, East Carolina Teachers College, Greenville
Eastern Carolina Training School for Boys, Rocky Mount
Grammar School, Greenville

Percy Bloxam, Salisbury
Group of buildings, Catawba College, Salisbury
Seven schools, Rowan County
Two schools, Rutherfordton County

T. E. Davis, Asheville
Sand Hill High School
Oakley School
French Broad School

William Henley Deitrick, Raleigh
Raleigh High School, Raleigh
County School, Carpenter, Wake County
North Wake School, Wake County

Douglas D. Ellington, Asheville
Senior High School, Asheville
Auditorium, Park Avenue School, Asheville
Central Service Plant, Municipal College, Asheville

Eric G. Flannagan, Henderson
Robersonville High School, Robersonville
Woodland-Olney School, Woodland
Charles Aycock School, Vance County

Ronald Greene, Asheville
High School, Valley Springs
High School, Weaverville
Stevens Lee High School, Asheville

Charles C. Hartmann, Greensboro
Proximity School, Greensboro
Franklinville School, Franklinville
Irving Park School, Greensboro

Q. E. Herman, Hickory
Balls Creek Consolidated School, Catawba County, Newton
Valdese High School, Valdese
Longview High School, Hickory

Charles C. Hook and Walter W. Hook, Charlotte
First Unit, Myers Park School, Charlotte
West Wing, Graham High School, Charlotte
Sarah Morrison Building, Queens College, Charlotte

James W. Hopper, Leaksville
Wentworth High School, Wentworth
Bethany Consolidated School, Bethany
Douglas High School, Leaksville

Herbert B. Hunter, High Point
New group of buildings, High Point College, High Point: Administration Building, Science Building, Boys' and Girls' Dormitories
New group of buildings, Elon College, Elon: Administration Building, Auditorium, Christian Education Building, Library Building, and Science Building
New group of eleven buildings (contract awarded for first two), Atlantic Christian College, Wilson

Lynch & Foard, Wilmington
Addition to Pineland School, Salemburg
Stephen's High School, Warsaw
Williston Industrial School, Wilmington

Harold Macklin, Winston-Salem
Colored High School, Winston-Salem
South Park Grammar School, Winston-Salem
Kimberly Park Grammar School, Winston-Salem

M. R. Marsh, Charlotte
Plaza Road School, Charlotte
Fairview Elementary School, Charlotte
Mt. Pleasant High School, Mt. Pleasant

Northrup & O'Brien, Winston-Salem
North Junior High School, Winston-Salem
South Junior High School, Winston-Salem
Columbia Heights Grade School, Winston-Salem

James A. Salter, Raleigh
Franklin Public School, Franklin
Administration Building, Methodist Orphanage, Raleigh
West Raleigh School, Raleigh

C. Gadsden Sayre, Greensboro
Hugh Morson High School, Raleigh
Boyden High School, Salisbury
Hall Fletcher High School, Asheville

Erle G. Stillwell, Hendersonville
Hendersonville High School, Hendersonville
Dana High School, Dana
Dormitory, Western Carolina Teachers College, Cullowhee

NORTH DAKOTA

Ernest R. Boyd, Jamestown
Washington Grade School, Jamestown
Teachers' Training School, Valley City
Teachers' Training School, Minot

Bugenhagen & Molander, Minot
Minot Junior High School, Minot
Velva State Agriculture High School, Velva
Rugby High School, Rugby

Jos. Bell DeRemer, Grand Forks
New Gymnasium and Classroom Unit, Central High School, Grand Forks
Liberal Arts Building, University of North Dakota, Grand Forks
St. Mary's Parochial School, Grand Forks

Gilbert R. Horton, Jamestown
High School, Litchfield, Minn.
Wimbledon Grade and High School, Wimbledon
Denhoff Grade and High School, Denhoff

Van Horn & Ritterbush, Bismarck
Roosevelt Grade School, Bismarck
Boys' Dormitory, State Training School, Mandan
Girls' Dormitory, State Training School, Mandan

OHIO

John Quincy Adams, Columbus
High and Junior High School, New Lexington
High School, Corning
Liberal Arts Building, College of St. Mary of the Springs, Columbus

John S. Adkins, Architect; **Hubert M. Garriott**, Associate Architect, Cincinnati
Riley Junior High School, Logansport, Ind.
Onward Consolidated School, Onward, Ind.
Denver Memorial Hall, Wilmington College, Wilmington

A. M. Allen & Co., Cleveland
Charles F. Brush High School, South Euclid
Maple Heights High School, Maple Heights
Southington Township School, Southington

Althouse & Jones, Mansfield
Mansfield Senior High School, Mansfield
Junior High School, Galion
Central Grade and High School, Leroy

John Woodhouse Bagley, Cleveland
Columbia Township High School addition, Columbia Center
Eaton High School, North Eaton
East Carlisle Grade School, La Porte

Geo. W. Barkman, Hamilton
Three Grade Schools, Hamilton
High School, Harrison
Hanover Township Centralized School, Butler County

Paul Boucherle, Youngstown
Rutherford B. Hayes Junior High School, Youngstown
Woodrow Wilson Junior High School, Youngstown
J. G. Butler Public School, Youngstown

Jos. N. Bradford, University Architect, Columbus
Ohio State University, Columbus
Commerce Building
Chemistry Building
Administration Building

The Carter-Richards Co., Cleveland
High School addition, Bedford
Ellenwood Grade School, Bedford
Interstate Grade School (heating), Bedford

Charles Frederick Cellarius, Cincinnati
Fairfax School, Plainville Rural School District, Hamilton County
Norwood Junior High School, Norwood
Beta Theta Pi House, University of Cincinnati

F. H. De Aement & Co., Akron
Woodland Grade School, Canton
Springfield Grade and High School, Ellet
Northampton Township Grade School, Summit County

De Voss & Donaldson, Portsmouth
Fourth Street Junior High School, Portsmouth
Campbell Avenue Elementary School, Portsmouth
New Boston High School, New Boston

Gustave W. Drach, Inc., Cincinnati
Victoria Hall (Nurses' Training School), Good Samaritan Hospital, Cincinnati
Heberle School, Cincinnati
Gymnasium and Auditorium Building, St. Bernard School, St. Bernard

Eastman & Budke, Springfield
Kenwood Heights Grade School, Springfield
Science Building, Antioch College, Yellow Springs (Herbert Baumer, Ohio State University, Consultant)
Hayward Junior High School, Springfield

Fechheimer & Ihorst, Cincinnati
Roosevelt Public School, Cincinnati
Group of buildings, Hebrew Union College, Cincinnati
Public School, Mariemont (model town)

Charles E. Firestone & Lowell Christman, Canton
John K. Baxter School, Canton
East Canton School, East Canton
Fairmount School, Canton

Fox, Duthie & Foose, Cleveland
Kensington School, Rocky River
Kirtland School, Kirtland
Allen School, Elyria

Charles W. Frank, Akron
Men's Club Building, Oberlin
Twelve Men's Buildings, Oberlin

H. O. Fullerton, Cleveland
Mexico Grade and High School, Mexico, N. Y.
West Leyden Central School, West Leyden, N. Y.
Constableville Grade and High School, Constableville, N. Y.

Fulton & Taylor, Cleveland
Berea High School, Berea
Parma Junior High School, Parma
Garfield Heights High School, Garfield Heights

Garber & Woodward, Cincinnati
Western Hills Junior-Senior High School, Cincinnati
Mt. Logan Public School, Chillicothe
Marietta High School, Marietta

Abram Garfield, Cleveland
Institute of Pathology, Western Reserve University, Cleveland
Music Building, Lake Erie College, Painesville
Science Building and Dormitory, Kenyon College, Gambier

Gebhart & Schaeffer, Dayton
Emerson Junior High School, Dayton
Jackson Elementary School, Dayton
Ruskin Elementary School, Dayton

Edwin M. Gee, Toledo
J. A. DeVilbiss High School, Toledo
J. D. Robinson Junior High School, Toledo
Harvard School, Toledo

J. Kerr Giffen, Canton
Cambridge Hall, Muskingum College, New Concord
Dennison Junior-Senior High School, Dennison
Smithfield High School, Smithfield

Glass & Ramsey, Columbus
Ashville High School, Ashville
Carroll High School, Carroll
St. Vincent de Paul School, Mt. Vernon

John H. Graham & Co., Cleveland
Laurel School for Girls, Cleveland
Roxboro Junior High School, Cleveland Heights
Oxford Grade School, Cleveland Heights

Harry Hake, Cincinnati
Electrical College, Cincinnati University, Cincinnati
Law College, Cincinnati University, Cincinnati
Administration Building, Lincoln Memorial University, Harrogate, Tenn.

Lawrence H. Hall, Springfield
Centralized High and Grade School, Pleasant Hill
Centralized High and Grade School, Jeffersonville
High School, Olive Branch, Clark County

Samuel Hannaford & Sons, Cincinnati
School for Crippled Children, Cincinnati
Wyoming Grade and High School, Wyoming
23rd District School, Cincinnati

Robert S. Harsh, Columbus
Miami University, Oxford:
Recitation Building
McGuffy Building
Fisher Hall and Oxford College Building (dormitories)

Geo. M. Hopkinson, Cleveland
John Hay High School, Cleveland
Nathan Hale Junior High School, Cleveland
Robert Fulton Elementary School, Cleveland

Hubbell & Benes Co., Cleveland
Fenn Building, Y.M.C.A. School of Technology, Cleveland
Alterations and Swimming Pool, Western Reserve Academy, Hudson
Shaker Heights School, Cleveland

Peter M. Hulsken, Lima; Lyman T. Strong, Associate
High School, Celina
High School, Van Wert
High School, Spencerville

Jokel & Lange, Toledo
Mt. Vernon School, Adams Township, Lucas County
Clay School, Oregon Township, Lucas County
Coy School, Oregon Township, Lucas County

Keich, O'Brien & Hosker, Warren
Warren G. Harding High School, Warren
East Junior High School, Warren
West Junior High School, Warren

Clarence A. Kissinger, Youngstown
Grade School, Unity Township, Columbiana County
Grade and High School, Knox Township, Columbiana County
Grade and High School, Middleton Township, Columbiana County

H. F. Kling & Son, Youngstown
N. H. Chaney Junior High School, Youngstown
Boardman High School, Boardman
Mineral Ridge Grade School, Mineral Ridge

William Koehl, Cleveland
Elementary School, St. Augustine's Academy, Lakewood
School and Chapel Building, Christ the King School, East Cleveland
New Annex, Gymnasium and alterations, Cathedral Latin School, Cleveland

M. M. Konarski, Akron
Ferdinand Schumacher School, Akron
David E. Hill School, Akron
Spicer School, Akron

Kraus & Helmkamp, Akron
St. Charles College, Columbus
St. Mary's High School, Lancaster
St. Sebastian's School, Akron

Kunz & Beck, Inc., Cincinnati
Mt. St. Mary Seminary, North Norwood
St. Joseph School, Covington, Ky.
St. Aloysius School, Elmwood Place

Langdon, Hohly & Gram, Toledo
Marsh Foundation Group, Van Wert: Instructors' homes, cottages, Industrial Arts School, power plant, etc.
Addition to Swanton High School, Swanton
Addition to Washington Township High School, Trilby

M. P. Lauer, Akron
W. F. Rimer School, Kenmore
Loyal Oak School, Norton Township
Silver Lake School, Silver Lake

The J. E. Lewis Co., Canton
Navarre High School, Navarre
Malvern High School, Malvern
Brewster High School, Brewster

Office of Charles J. Marr, New Philadelphia
Canal Fulton High School, Canal Fulton
East Sparta High School, East Sparta
Bolivar High School, Bolivar

W. M. McClure, Dayton
Fairview Grade School, Dayton
Westwood Grade School, Dayton
Washington Grade School, Dayton

Thomas D. McLaughlin & Associates, Lima
Notre Dame College, South Euclid
Middletown Schools, Middletown
Findlay Schools, Findlay

Miller & Reeves, Columbus
Bexley Elementary and Junior High School, Columbus
Upper Arlington School, Upper Arlington, Columbus (Howard Dwight Smith, Associate Architect)
St. Paul's Parish House Church School, Columbus

Miller & Son, Youngstown
McDonald High School, McDonald
Brecksville High School, Brecksville
Cleveland Grade School, Youngstown

H. C. Millott, Sandusky
Central High School, Bellevue
Grade School and Gymnasium, Sycamore
Grade School, West Perkins Township

Mills, Rhines, Bellman & Nordhoff, Toledo
Toledo University Group, Toledo
Nazareth Hall (Boys' School), Grand Rapids
Ottowa Hills Elementary and Junior High School, Ottowa Hills

William Mills, Nelsonville
Gallipolis School, Gallipolis
Albany Consolidated School, Albany
Pomeroy School, Pomeroy

Frederick G. Mueller & Walter R. Hair, Hamilton
Junior High School, Hamilton
Catholic High School, Hamilton
Centralized School, Liberty Township, Butler County

Ralph Murray, Ironton
High School, Raceland, Ky.
High School, Chapmanville, W. Va.
High and Grade School, Waterloo

Nicklas & Rodrick, Cleveland
Shaw Technical High School, East Cleveland
Rocky River High School, Rocky River
Roosevelt Grammar School, South Euclid

Peterson & Clarke, Steubenville
Grant Junior High School, Steubenville
Toronto High School, Toronto
Cross Creek District High School, Follansbee, W. Va.

F. J. Porter, Columbus
Rushcreek Memorial High School, Bremen
Piketon Rural High School, Piketon
Johnstown-Monroe Rural School, Johnstown

Potter-Gabele & Co., Cleveland
St. Mary's Parochial Grade and High School, Massillon
St. John the Baptist School and Auditorium, Akron
St. Benedict's Auditorium, Cleveland

Walter A. Rabold, Inc., Canton
Jefferson High School, R. R. No. 6, Dayton
Tuscarawas Grade and High School, Tuscarawas
Midvale High School, Midvale

Vernon Redding & Associates, Mansfield
Lincoln Junior High School, Canton
High School, Shelby
High School, Ashland

George B. Rheinfrank, Toledo
Maumee High School, Maumee
Chemical Laboratory, Defiance College, Defiance
Rossford Grade School, Rossford

Richards, McCarty & Bulford, Columbus
Ada Junior-Senior High School, Ada
High School, Canal Winchester
Four Marion Township schools, Franklin County

T. Ralph Ridley, Akron
Wooster Senior and Junior High School, Wooster
Medina High School, Medina
Perkins Normal School, Akron

Riebel Sons & Matheny, Columbus
Groveport Grade and High School, Groveport
Crooksville High School, Crooksville
Reynoldsburg Grade and High School, Reynoldsburg

Anton Rieg, Cincinnati
St. George's Parochial School, Cincinnati
St. Joseph of Nazareth School, Cincinnati
St. Joseph's School, Cincinnati

Ronan & Ingleson, Inc., Columbus
Teachers' Training Building, Kent State College, Kent
Ascension Hall, Kenyon College, Gambier
High School and Auditorium, Oxford

Morris W. Scheibel & Wilbert H. Shaffer, Youngstown
Stambaugh School, Youngstown
Scienceville High School, Youngstown
Coitsville Township Schools, Youngstown

Schenck & Williams, Dayton
Roosevelt High School, Dayton
Oakwood High School, Oakwood Village, Dayton
Oakwood Grade School, Oakwood Village, Dayton

Granville E. Scott, Norwalk
High School, Willard
Grade and High School, Genoa
Washington High School, Utica

J. F. Sheblessy, Cincinnati
St. Bonaventura School, Cincinnati
St. Rita School for Deaf, Lockland
Roger Bacon High School, St. Bernard

S. H. Shively & Son, Fremont
Three Elementary Schools, one Junior High School, Fremont
Centralized School, Washington Township
Centralized School, Bettsville

Howard Dwight Smith, Columbus
One Senior High School, three Junior High Schools, and three Elementary Schools (for Board of Education), Columbus
Gymnasium and Field House, Wittenberg College, Springfield
Orton Memorial Laboratory, Columbus (Miller & Reeves, Associate Architects)

Smull & Unger, Ada
John H. Taft Gymnasium, Ohio Northern University, Ada
College of Law Building, same
Centralized High School, Zanesfield

Snyder & Babbitt, Architects and Engineers, Columbus
North High School, Columbus
Library and Assembly Hall, Indiana State Normal School, Muncie Training School, same

Jos. G. Steinkamp & Bro., Cincinnati
St. Xavier Library, St. Xavier College, Cincinnati
Field House, same
Auditorium and addition, Garfield School, Cincinnati

S. P. Stewart & Son, Bowling Green
Dormitory for Women, Bowling Green State Normal College, Bowling Green
Senior High School, Bowling Green
Malinta-Grelton Grade and High School, Malinta

Tietig & Lee, Cincinnati
Sayler Park School, Cincinnati
Addition to Kilgour School, Cincinnati
Addition to Hughes High School, Cincinnati

William Unger, Bucyrus
New Washington Rural School, New Washington
Jefferson Rural School, Leesville
John H. Taft Gymnasium, Ohio Northern University, Ada

Walker & Norwick, Dayton
Lincoln Junior High School, Dayton
Elementary and High School, North Baltimore
High School, Gibsonburg

Walker & Weeks, Cleveland
Group of five buildings, University School, Cleveland
Group of two buildings, Hathaway Brown School, Cleveland
Group of eleven buildings, Wesleyan College, Macon, Ga.

H. L. Wardner, Akron
Harmony School, Mingo Junction
Washington School, Canton
New Bedford High School, New Bedford, Mass.

Warner & Mitchell, Cleveland
Group of buildings, University of Kentucky, Lexington, Ky.
Group of buildings (for Board of Education), Ashland, Ky.
Group of buildings (for Board of Education), Cleveland

Richard A. Zenk & Roy T. Campbell, Youngstown
Hubbard Grade School, Hubbard
Gustavus High and Grade School, Gustavus
Conneaut Grade School, Conneaut

OKLAHOMA

Leonard H. Bailey, Oklahoma City
Prague High School, Prague
Hawthorne School, Oklahoma City
Shydler School, Oklahoma City

A. C. Davis & Sons, Shawnee
Woodrow Wilson School, Shawnee
Horace Mann School, Shawnee
Grade School, Wewoka

Jos. I. Davis, Oklahoma City
High School, Idabel
Girls' Dormitory and Administration Building, Eastern Oklahoma College, Wilburton
Girls' Dormitory, Oklahoma Baptist University, Shawnee

The Huseman Co., Chickasha
High School, Quay
High School, Tipton
High School, Hollister

Layton, Hicks & Forsyth, Oklahoma City
Library Building, University of Oklahoma, Norman
Capitol Hill Senior High School, Oklahoma City
Fine Arts Building, Oklahoma City University, Oklahoma City

A. J. Love & Co., Tulsa
High School, Wagoner
Barracks Building, Oklahoma Military Academy, Claremore
Public School, Broken Arrow

Donald McCormick, Tulsa
Group of buildings, Cascia Hall, School of the Augustinian Fathers, Tulsa
School and Rectory, St. Francis Xavier Parish, Tulsa
Junior League Home and School for Convalescent Crippled Children, Tulsa

Richard E. Richter, Okmulgee
Checotah Grade School, Okmulgee
Horace Mann Grade School, Okmulgee
Addition to High School, Okmulgee

Albert S. Ross, Ada
Senior High School, Ada
Health Education Building, East Central State Teachers College, Ada
High School, Konowa

Leon B. Senter, Tulsa
High School, Ponca City
High School, Okmulgee
Grade Schools, Ponca City (not yet built)

R. W. Shaw, Enid
Lincoln Elementary School, Enid
Gymnasium, Auditorium and Administration Building, Enid School System, Enid
Longfellow Junior High School, Enid

Leland I. Shumway, Tulsa
Red Fork School, Tulsa
Carbondale School, Tulsa
Dawson School, Tulsa

Sorey & Vahlberg, Oklahoma City
Oklahoma Union Building, Oklahoma University, Norman
Library Building, Southeastern Teachers College, Durant
Gymnasium and Shops Building, Central High School, Oklahoma City

H. O. Valeur & Co., Muskogee
Junior High School, Muskogee
Grade School, Stone Bluff
Negro High School, Muskogee

OREGON

Bennes & Herzog, Portland
Men's Dormitory Group, Oregon State College, Corvallis
Women's Building, Oregon State College, Corvallis
State Normal School, La Grande

C. N. Freeman, Portland
Beaverton High School & Gymnasium, Beaverton, Washington County
Oakridge High School, Oakridge, Lane County
Union High School, District No. 1, Benton County

Joseph Jacobberger & Alf. H. Smith, Portland
Gymnasium Building, Columbia University, Portland
St. Vincent's School of Nursing, Portland
Marylhurst College, Oswego

George H. Jones, Portland
Duniway School, Portland
Girls' Polytechnic School, Portland
High School of Commerce, Portland

Knighton & Howell, Portland
Group of buildings, U. S. Grant High School, Portland
Junior High School, Salem
State Training School for Teachers, Independence

Lawrence, Holford, Allyn & Bean, Portland
Campus layout, University of Oregon, Eugene: Science Building, Basketball Pavilion, Men's Dormitory
Clinic Building, University of Oregon Medical School, Portland

F. Marion Stokes, Portland
Milwaukie Union High School, Milwaukie
Ridgefield Combination Grade and High School, Ridgefield, Wash.
Battle Ground Union High School, Battle Ground, Wash.

Tourtellotte & Hummel, Portland
High School, Boise, Idaho
High School, Medford
Normal Grade and Training School, Ashland

F. Manson White, Portland
Albany College Building, Albany
Two Junior High Schools, Eugene
Chapman School, Portland

PENNSYLVANIA

The Ballinger Co., Philadelphia
Public Grade School, Woodbury, N. J.
Addition to Junior High and Grade School, Marcus Hook
Alpha Sigma Phi Fraternity House, State College

P. A. Bartholomew, Pittsburgh
Derry Township High School, West Derry
Salina High School, Salina
Southwest Greensburg Junior High School, Greensburg

The Office of George C. Baum, Philadelphia
New group of buildings, Gettysburg College, Gettysburg
New group of buildings, The Lutheran Orphans' Home of the South, Salem, Va.
Denhart Hall, Carthage College, Carthage, Ill.

Francis A. Berner, Pittsburgh
Grade School, Reserve Township, Allegheny County
Phi Gamma Fraternity House, Washington
Chapel and Dormitory, Toner Institute, Pittsburgh

Boyd, Abel & Gugert, Philadelphia
Junior High School, Haverford Township
Rosemont Grammar School and Auditorium, Radnor Township
Manoa Public School, Haverford Township

Clarence W. Brazer, Chester (also New York City)
Senior High School, Collingdale
Glen-Nor High School, Glenolden
Washington Avenue Elementary School, Prospect Park

Brenot & Hicks, Erie
School, Guys Mills
School, Cranberry Township
High School, McKean

J. C. Brenton, Charleroi
Junior High School, Charleroi
Consolidated School, Fallowfield Township, Washington Co.
Centerville Grade School, Centerville

George W. Brugger, Canonsburg
Trinity High School, Washington
First Ward Grade School, Canonsburg
Hawthorne School, Canonsburg

Irwin T. Catharine, Philadelphia
Overbrook High School, Philadelphia
Group of two buildings: Simon Gratz Senior High School and Gillespie Junior High School, Philadelphia
Olney High School, Philadelphia

Clepper & Clepper, Sharon
Sharon Junior-Senior High School, Sharon
Wengler Avenue Grade School, Sharon
Sharpsville High School, Sharpsville

Cody & Kirby, Erie
West Millcreek High School, Erie County
Lawrence Park Grade and High School, Erie County
Lakewood Grade School, Erie County

Conrad C. Compton, Donora
Donora High School, Donora
Cumberland Township High School, Carmichaels
Ludwick Grade School, Greensburg

Arthur P. Coon, Scranton
James Madison Grade School, Scranton
Philip Morse Grade School, Scranton
Moscow High School, Moscow

Paul P. Cret, Philadelphia
John Herron Art Institute School, Indianapolis, Ind.
Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia
Barnes Foundation, Merion

W. Holmes Crosby & Co., Oil City
Elizabeth Crawford School, Emlenton
14th St. School, Franklin
Third Ward School, Franklin

Henry D. Dagit & Sons, Philadelphia
St. Joseph's School, Camden, N. J.
St. Frances de Sales School, Philadelphia
St. Madeleine Sophie's School, Philadelphia, Pa.

Davis & Dunlap, Philadelphia
Woodrow Wilson Junior High School, Camden, N. J.
Charles Sumner School, Camden, N. J.
Thomas Williams School, Wyncote, Montgomery County

Office of J. A. Dempwolf, York
Shippensburg High School, Shippensburg
Bachman Memorial Parochial School, New Cumberland
St. John's Parochial School, York

Press C. Dowler, Pittsburgh
Sewickley High School, Sewickley
Dormont High School, Pittsburgh
Etna High School, Etna

W. G. Eckles Co., New Castle
R. A. Browne Dormitory, Westminster College, New Wilmington
Midland High School, Midland
Sewickley Academy, Sewickley

Folsom & Stanton, Philadelphia
St. Louis School, Yeadon
Philip Baker School, Wildwood Crest, N. J.
Primary and Junior High School, Sharon Hill

Fred A. Fuller, Erie
Fairview High School, Fairview
Group of buildings, St. John Kanty College, Erie: Dining Hall, Dormitories and Chapel
Group of buildings, Gannon Hall Boarding School, Erie: Chapel, Dormitories and Classrooms

D. H. Grootenboer, Pottsville (also New York City and Bethlehem)
Gass Hill Grade School, Gass Hill
Brownsville Grade School, Brownsville
Tamaqua High School, Tamaqua

John B. Hamme, York
William Penn Senior High School, York
Memorial Library, Gettysburg College, Gettysburg
Dormitory Building, Hood College, Frederick, Md.

Lewis Hancock, Scranton
Consolidated High School, Damascus
Addition to High School, Taylor
Grade School and Gymnasium, Old Forge

Hasness & Albright, Harrisburg
High School and W. H. Ramsey Grade School, Stroudsburg
W. W. Rupert Memorial Grade School, Pottstown
High School, Spring City

Heacock & Hokanson, Philadelphia
Upper Darby Junior High School, Upper Darby Township
Abington Junior and Grade School, Abington Township
Jenkintown High School, Jenkintown

Hersh & Shollar, Altoona
Altoona Senior High School Annex, Altoona
Keith Junior High School, Altoona
Junior High School, Lewistown

Hoffman-Henon Co., Philadelphia
La Salle College Group, Philadelphia
West Philadelphia Catholic High School for Girls, Philadelphia
North East Catholic High School for Boys, Philadelphia

R. G. Howard, Du Bois
Clearfield High School, Clearfield
Johnsonburg High School, Johnsonburg
Homer City High School, Homer City

Norman Hulme, Philadelphia
Philadelphia College of Pharmacy and Science, Philadelphia
Women's Homeopathic Hospital and Nurses' Training School, Philadelphia
Reformed Church Bible School, Philadelphia

Hunter & Caldwell, Altoona
Fairview Grade School, Altoona
Gaysport School, Hollidaysburg
Consolidated School, Alexandria

Ingham & Boyd, Pittsburgh
Training School for Teachers, Board of Education, Pittsburgh
Administration Building, same
Group of buildings, Shady Side Academy, Pittsburgh: Dining Hall, Dormitory and Gymnasium

Jacoby & Everett, Allentown
Dormitories and power-plant, Cedar Crest College, Allentown
Harrison and Morton High School, Allentown
High School, Nurses' College and Hospital, Sacred Heart Diocese, Allentown

Janssen & Cocken, Pittsburgh
Hygeia Hall, College of Wooster, Wooster, Ohio
School, Annunciation Parish, Pittsburgh
Alumni Hall, University of Pittsburgh, Pittsburgh

Emil R. Johnson & Clarence F. Wilson, Uniontown
Lafayette Junior High School, Uniontown
Charles E. Boyle Elementary School, Uniontown
Addition to Uniontown Senior High School, Uniontown

Karcher & Smith, Philadelphia
Women's Fraternity Lodges and Bond Memorial Building, Swarthmore College, Swarthmore
Clothier Auditorium, Swarthmore College, Swarthmore
Chi Phi Fraternity House, Franklin and Marshall College, Lancaster

Lawrie & Green, Harrisburg
Senior High School, Hazleton
High School, New Cumberland
State Teachers College, Gymnasium Building, Indiana

Edward B. Lee, Pittsburgh
Peabody High School, Pittsburgh
Morgantown High School, Morgantown, W. Va.
Clifford B. Connelley Trade School, Pittsburgh

W. H. Lee, Philadelphia
Temple University College Building, Philadelphia
Temple University Medical School, Philadelphia
Temple University Union, Philadelphia

C. Howard Lloyd, Harrisburg
William Penn High School Group, Harrisburg
Auditorium and Gymnasium, High School, Steelton

Mack & Sahm, Wilkes-Barre
Kingston High School, Kingston
West Pittston Junior and Senior High School, West Pittston (Collaborating Architect, Thomas H. Foster)
Pringle Grade School, Kingston

MacKenzie & Wiley, Philadelphia
Media Public School, Media
Eddystone Grammar School, Eddystone
Central School, Springfield, Delaware County

Magaziner, Eberhard & Harris, Philadelphia
Arter Hall, Allegheny College, Meadville
Murphy College Group, Sevierville, Tenn.: Administration Building, Recitation Hall, Boys' and Girls' Dormitories and Chapel
East Maine Conference Seminary, Bucksport, Me.

Office of A. Oscar Martin, Doylestown
Bensalem Township High School, Cornwells Heights
Bensalem Township Public Schools, Andalusia and Trevose
Middletown Township High School, Langhorne

J. M. McCollum, Pittsburgh
Centennial School, McKeesport
High School, Washington
Wilkins School, Swissvale

Mellor, Meigs & Howe, Philadelphia
Auditorium and Music Wing, Bryn Mawr College, Bryn Mawr
Science Hall, Haverford College, Haverford
Gymnasium, Pennsylvania Institute for the Deaf, Mount Airy, Philadelphia

Meyers & Johnson, Architects and Engineers, Erie
Wilson Junior High School, Erie
Rice Avenue Union High School, Girard
Harding Elementary School, Erie

Wm. M. Michler, Easton
Easton Senior High School, Easton
Schull Junior High School, Easton
Porter Grade School, Easton

C. R. Moffitt, McKeesport
Walnut Street School, Archer Street School and Market Street School, McKeesport
Hebrew Institute, McKeesport
Sacred Heart School, McKeesport

Paul Monaghan, Philadelphia
Science and Engineering Building, Villa Nova College, Villa Nova
Mt. St. Joseph's College for Women, Chestnut Hill
Library and Dormitory, Immaculata College, Frazier

Morris & Erskine, Philadelphia
Friends High School, Moorestown, N. J.
Moses Brown School, Providence, R. I.
Dormitory, Auditorium and Gymnasium, Cheyney Training School for Teachers, Cheyney

Muhlenberg Bros., Reading
Thirteenth and Union Streets Grade School, Reading
Union Township Consolidated Grade School, Ringtown
Albright College Group of new buildings, Reading

Frederick A. Muhlenberg, Reading
Four Grade Schools, Reading
Grade School, Lower Alsace Township
High School, Shillington

Charles R. Peddle, Philadelphia
Thomas A. Edison School, Westmont, N. J.
Stoy School, Westmont, N. J.
Bettlewood School, Westmont, N. J.

Emile G. Perrot, Philadelphia (also New York City)
Library, Fordham University, Fordham, N. Y.
Notre Dame Academy, Moylan
Academy of the Sisters of the Order of St. Dominic, Newburgh, N. Y.

John H. Phillips, Pittsburgh
Miles Bryan High School, McKees Rocks
Margaret Bell Miller School, Waynesburg
Franklin Township High School, Westmoreland County

Watson K. Phillips, Philadelphia
York Avenue Grade School, Lansdale
Forest Avenue Grade School, Ambler
Whitpain Township High and Grade School, Blue Bell

Alexander I. Prawdzik, Scranton
St. Stanislaus Orphanage Group, Sheatown (near Nanticoke)
Visitation of Blessed Virgin Mary Parochial School, Dickson City
Sacred Heart Parochial School, Scranton

Price & Walton, Philadelphia
Philips Memorial Building, State Teachers College, West Chester
Friends School, Atlantic City, N. J.
Dormitory for Girls, Oak Grove Seminary, Vassalboro, Me.

Henry L. Reinhold, Jr., Philadelphia
Academy of the New Church, Bryn Athyn
High School, Windber
Fraternity House, State College

Ritcher & Eiler, Reading
Senior High School, Reading
State Teachers College Training School, Lock Haven
Cochran Grade School, Williamsport

Ritter & Shay, Philadelphia
Huntington High School, Huntington, W. Va.
Liberty High School, Bethlehem
David Rittenhouse Junior High School, Norristown

Ruhe & Lange, Allentown
Library, Muhlenberg College, Allentown
Consolidated School No. 1, Troxell's Crossing, South Whitehall Township
Annex and Gymnasium Buildings, Allentown High School, Allentown

Savery & Scheetz, Philadelphia
Junior High School, Lower Merion Township, Ardmore
Ashland Elementary School, Lower Merion Township, Ardmore
Junior High School Vocational Building, Lower Merion Township, Ardmore

Scholl & Richardson, Reading
Southern Junior High School, Reading
Annville High School, Annville
Oley Township School, Oley

Schwab, Palmgreen & Merrick, Pittsburgh
Langley High School, Pittsburgh
Versailles Borough School, Versailles
Sumac Street School, McKeesport

Henry Y. Shaub, Lancaster
George Ross Grade School, Lancaster
Manheim High School
West Lampeter Vocational High School, Lampeter

W. D. Shollenberger, Williamsport
Jackson Township School, Millerton
J. George Becht School, Williamsport
Montgomery-Clinton School, Montgomery

H. Rex Stackhouse & W. W. Donohoe, Philadelphia
North Wildwood High School, North Wildwood, N. J.
A. V. Wood Gymnasium, Brunswick, Ga.
Middle Township High School, Cape May Court House, N. J.

James T. Steen & Sons, Pittsburgh
David B. Oliver Junior-Senior High School, Pittsburgh
Herron Hill Junior High School, Pittsburgh
O'Hara Township Grade School, Allegheny County

Louis Stevens, Pittsburgh
Grade School, Overbrook, Allegheny County
Dormitory, Polk State School, Polk
Hospital Building, Polk State School, Polk

Stewardson & Page, Philadelphia
Laboratory of Anatomy and Physiological Chemistry, University of Pennsylvania, Philadelphia
Dormitories, same
Dormitory, Haverford College, Haverford

G. W. Stickle, Erie
New group of buildings, Gannon Hall Boarding School, Erie
New building, St. John Kanty College, Erie
New group of buildings, St. Mary's College, North East

Carlton Strong, Pittsburgh
Holy Cross Parish School, Glassport
Mt. Mercy School, Pittsburgh
St. George Parish School, Pittsburgh

The Thayer Co., New Castle
Old Main Memorial, Westminster College, New Wilmington
George Washington Junior High School, New Castle
Phillips Hall (girls' dormitory), Bethany, W. Va.

Robert Maurice Trimble, Pittsburgh
Perry Hill School, Pittsburgh
Taylor Alderdice High School, Pittsburgh
Taylor Alderdice High School Extension, Pittsburgh

Horace Trumbauer, Philadelphia
Two new groups, Duke University, Durham, N. C.
Irvine Auditorium, University of Pennsylvania, Philadelphia
Ogontz School for Girls, Rydal

Van's Engineering Service (Henry M. Rogers, Architect), Blairsville
Ebensburg High School, Ebensburg
Blairsville High School, Blairsville
Washington Township Grade School, Apollo

Albert J. Ward, Scranton
Technical High School, Scranton
Grade School No. 42, Scranton
Lincoln School, Blakely

Frank R. Watson, Edkins & Thompson, Philadelphia
Group of buildings, Ursinus College, Collegeville: Dormitory Group, Gymnasium and Dining Hall
Consolidated School, Dover, Del.
Oaklyn Public School, Oaklyn, N. J.

Ralph E. White, Philadelphia
Wynnewood Road Grade School, Wynnewood
Bryn Mawr Grade School, Bryn Mawr
Additions to Senior High School, Ardmore

Adam G. Wickersham, Homestead
St. Mary Magdalen's School, Homestead
Grade School, Munhall
Junior High School, Homestead

W. Ward Williams, Pittsburgh
Junior High School, Ambridge
High School, Freedom
Anthony Wayne Grade School, Ambridge

Eric Fisher Wood & Co., Pittsburgh
Pennsylvania Training School, Morganza
State Teachers College, Mansfield
St. Irenaeus School, Pittsburgh

RHODE ISLAND

Walter F. Fontaine, Woonsocket
Woonsocket Junior High School, Woonsocket
College of Mount St. Charles, Woonsocket
Blackstone High School, Blackstone, Mass.

Joseph A. Hickey, Providence
Sons of Zion (special), Providence
Fairchild (elementary), Miami, Fla.
Velodrome (gymnasium), Hartford, Conn.

Howe & Church, Providence
Dormitory, St. George's School, Middletown
Junior High School, Bristol
Gymnasium, Brown University, Providence

Monahan & Meikle, Pawtucket
Senior High School, Pawtucket
Samuel Slater Junior High School, Pawtucket
Joseph Jenks Junior High School, Pawtucket

John F. O'Malley, Pawtucket
Holy Name Parish School, Providence
Central Falls High School, Central Falls
Assumption Parish School, Providence

Thomas J. Hill Peirce, Providence
Session Street Junior High Schools, Providence
Chalkstone Avenue Junior High School, Providence
Hartford Avenue Junior High School, Providence

William R. Walker & Son, Providence
Senior High School, Cranston
Rhode Island College of Education, Providence
Junior High School, East Providence

SOUTH CAROLINA

F. H. & J. G. Cunningham, Greenville
Grey Court-Owings School Group, Grey Court
Stone School, Greenville
Woodruff High School, Woodruff

Charles William Fant, Anderson
Boys High School, Anderson
Grammar School, Seneca
Dormitory, Presbyterian College, Clinton

H. D. Harrall, Bennettsville
Gymnasium, Elementary School, Bennettsville
High School, Latta
Elementary School, Dillon

David B. Hyer, Charleston
Murray Vocational School, Charleston
North Charleston Graded School, North Charleston
Georgetown High School, Georgetown

J. Carroll Johnson, Columbia
Group of buildings, University of South Carolina, Columbia: Sloan College, Field House, Melton Memorial Observation; additions to and restoration of Library
Three Schools, Lancaster, S. C.

Lafaye & Lafaye, Columbia
Columbia College, Columbia
Shandon School, Columbia
High School, Summerville

Rudolph E. Lee, Clemson College
Girls' Dormitory, Lander College, Greenwood
Engineering Building, Clemson Agricultural and Mechanical College, Clemson College
Field House, Clemson Agricultural and Mechanical College, Clemson College

J. D. Newcomer, Charleston
St. Paul's High School, St. Paul Parish, Charleston County
Ridgeland High School, Ridgeland
Rosemont School, Rosemont

C. Gadsden Sayre, Anderson
Boyden High School, Salisbury, N. C.
Hugh Morson High School, Raleigh, N. C.
Hall Fletcher High School, Asheville, N. C.

J. E. Sirrine & Co., Greenville
Dormitory, Furman University, Greenville
Dining Hall, same
Athletic Building, same

James B. Urquhart, Columbia
Senior High School, Columbia
Junior High School, Columbia
Beaufort High School, Beaufort

W. Paul William, Spartanburg
High School, Inman
Colored Grammar School, Spartanburg
Pine Street School, Spartanburg (Associate Architect with Chas. C. Wilson, Columbia)

Wilson & Tatum, Columbia
Greenwood High School, Greenwood (J. C. Hemphill, Associate Architect)
Pine Street Grammar School, Spartanburg
High School, Lexington

SOUTH DAKOTA

Walter J. Dixon, Mitchell
Auditorium, Yankton High School, Yankton
Tyndall Grade School, Tyndall
New Underwood Grade and High School, New Underwood

Geo. F. Fossum, Aberdeen
Elementary School, Milbank
Simmons Elementary School, Aberdeen
High School, Havana

Hugill & Blatherwick, Sioux Falls
Gymnasium and Armory Building, University of South Dakota, Vermilion
High School, Belle Fourche
High School, Pierre

F. C. W. Kuehn, Huron
Science Hall, Brookings College, Brookings
Jefferson Grade School, Huron
Wilson Grade School, Huron

Perkins & McWayne, Sioux Falls
Library, State College of Agriculture and Mechanic Arts, Brookings
Auditorium, University of South Dakota, Vermilion
Washington High School, Sioux Falls

TENNESSEE

Alsop & Callanan, Memphis
Hulbert Separate School District, Hulbert, Ark.
Tuscumbia High School, Tuscumbia, Ala.
Rolling Fork Consolidated School, Rolling Fork, Miss.

George Awsumb, Memphis
South Side High School, Memphis
L. C. Humes High School, Memphis
Hernando Consolidated Grade and High School, Hernando, Miss.

Barber & McMurray, Knoxville
University of Tennessee, Knoxville:
Physics and Geology Building
Chemistry Building
Library Building
(Grant C. Miller, Advisory Architect)

Baumann & Baumann, Knoxville
Knoxville High School, Knoxville
Park City High School, Knoxville
High School for Colored, Knoxville

D. R. Beeson, Johnson City
Jefferson School, Bristol, Va.
Elizabethton High School, Elizabethton
Radford High School, Radford, Va.

Coile & Cardwell, Johnson City
North Side School, Johnson City
Crescent Grammar School, Greeneville
Gymnasium, Tusculum College, Tusculum

William Crutchfield, Chattanooga
Dixie Portland Memorial School, Richard City
East Lake Junior High School, Chattanooga
Library, Du Bose Church Training School, Monteagle

Allen N. Dryden, Kingsport
Dobyns-Bennett High School, Kingsport
High School, Gate City, Va.
Church School, Rogersville

R. H. Hunt Co., Chattanooga (also Dallas, Texas)
McFarlin Memorial Auditorium, Southern Methodist University, Dallas, Texas
Training School, East Tennessee State Teachers College, Johnson City
Spring City High School, Spring City

Clarence T. Jones, Chattanooga
Clara Carpenter School, Chattanooga
Morristown High School, Morristown
Arnold Memorial School, Cleveland

Manley & Young, Knoxville
Administration Building, Tennessee Wesleyan College, Athens
Monroe County High School, Sweetwater
Harriman High School, Harriman

Estes W. Mann, Memphis
Paragould High School, Paragould, Ark.
Hughes High School, Hughes, Ark.
Forrest City High School, Forrest City, Ark.

M. E. Parmelee, Knoxville
Gymnasium, Mars Hill College, Mars Hill, N. C.
Melrose Dormitory, same
Brown Dormitory, same

Regan & Weller, Memphis
Booker T. Washington Industrial School, Memphis
St. Agnes College Building, Memphis
Father Ryan High School, Nashville

W. H. Sears, Chattanooga
H. Clay Evans Grammar School, Chattanooga
Rhea Central High School, Dayton
Lookout Junior High School, Chattanooga

Gordon L. Smith, Chattanooga
Joseph E. Smith Elementary School, Chattanooga
Addition to Dickinson Junior High School, Chattanooga
Recreation Building, McCallie School, Chattanooga

Geo. D. Waller, Nashville
Group of three buildings, Montgomery Bell Academy, Nashville
Two Elementary Schools, Davidson County
Jones Avenue Elementary School, Nashville

TEXAS

Arthur A. Brown, Dallas
State Home High School, Corsicana
Randolph College, Cisco
High School, Farwell

Bryan & Sharp, Dallas
Addition, Winnetka Grade School, Dallas
North and South Tyler Junior High Schools, Tyler
Roger Q. Mills Grade School, Dallas

Ralph H. Cameron, San Antonio
McAllen High School, McAllen
Luling Public School, Luling
Carrizo Springs High School, Carrizo Springs

Guy A. Carlander, Amarillo
High School, Tulia
High School, Childress
Margaret Wills School, Amarillo

Lamar Q. Cato, Houston
George Washington Junior High School, Houston
Stonewall Jackson Junior High School, Houston
Woodrow Wilson Elementary School, Houston

W. G. Clarkson Co., Fort Worth
Stripling High School, Fort Worth
Masonic Home School, Fort Worth
North Fort Worth Junior High School, Fort Worth

Curtis & Thomas, Dallas
High School, Carthage
York School, Dallas
Feldman Court School, Houston

DeWitt & Washburn, Dallas
Harlingen High School, Harlingen
Woodrow Wilson High School, Dallas (Associate Architects)
Mart High School, Mart

Leo M. J. Dielmann, San Antonio
Holy Ghost Convent, San Antonio
Manual Arts High School, Yoakum
Immaculate Heart of Mary School, San Antonio

Flint & Broad, Dallas
Lagow School, Dallas
Buckner Orphans Home High School, Dallas County
Wheatley School, Dallas

T. J. Galbraith, Dallas
Hillsboro High School and Junior College, Hillsboro
Stephen J. Hay Elementary School, Dallas
Shawnee Park Elementary School, Graham

Giesecke & Harris, Houston (also Austin)
New group of buildings, Primary-Junior High School—Senior High School and Junior College, Edinburg
New unit, Senior High School, Austin
High School, Brenham

L. A. Glover, Houston
Miller Senior High School, Houston
John Reagan Senior High School, Houston
Jim Deady Junior High School, Houston

Herbert M. Greene, LaRoche & Dahl, Dallas
Laboratory Building, Medical College, Galveston
Garrison Hall, University of Texas, Austin
Biology Building, University of Texas, Austin

Hamon & Co., Corpus Christi
Odem High School, Odem
Three Rivers High School, Three Rivers
Ingle Side High School, Ingle Side

Hardy & Curran, Corpus Christi
Corpus Christi College, Corpus Christi
Corpus Christi Senior High School, Corpus Christi
Del Mar Grade School, Corpus Christi

Wyatt C. Hedrick, Inc., Fort Worth
Texas Technical College Group, Lubbock: Administration Building, Chemistry Building, Engineering Building (Wm. Ward Watkin, Houston, Associate Architect)

Kelwood Co., Inc., San Antonio
Brownwood Ward School, Brownwood
Los Fresnos School, Los Fresnos
Point Isabel School, Point Isabel

Kerr & Walsh, Amarillo
High School, Plainview
High School, Ralls
Ward School, Plainview

M. C. Kleuser, Dallas
Cuero High School, Cuero
N. W. Harllee School, Dallas
Junior High School, Stephensville

H. F. Kuehne, Austin
Four dormitories and Manual Training Building, Austin State School, Austin
Abernathy High School, Abernathy

C. H. Leinbach, Dallas
Atlanta High School, Atlanta
Two Elementary Schools, Mexia
Wilmer Hutchins High School, Dallas

Mark Lemmon, Dallas
Thomas Jefferson Junior High School, Port Arthur
Woodrow Wilson High School, Dallas (Associate Architect)
Robert E. Lee School, Port Arthur

Livesay & Wiedemann, Beaumont
Daisetta High School, Daisetta
Beaumont Public Schools, Beaumont
South Park School (Giles School), Beaumont

John M. Marriott, San Antonio
Ward School, San Antonio
Ward School, Laredo
Ward School, Corpus Christi

McLelland & White, Houston
Park Junior High School, Houston
Galena High School, Houston
Pasadena High School, Houston

Morris & Noonan, San Antonio
Harlandale Junior High School, San Antonio
Morrill Elementary School, San Antonio
Highland Park School, San Antonio

Joseph W. Northrop, Jr., Houston
Educational Building, First Evangelical Church, Houston
Educational Building, Trinity Episcopal Church, Marshall
Vocational Building, Taylor School, Houston

Harry A. Overbeck, Dallas
Bowie School, Dallas
City Park School, Dallas
Julia C. Frazier School, Dallas

Page Bros., Austin
High School, Texas City
High School, Sweetwater
High School, Sinton

Harry D. Payne, Houston
Eugene Field Elementary School, Houston
Phillis Wheatley Colored High School, Houston
Charles Bender High School, Humble

Peters, Strange & Bradshaw, Lubbock
High School, Lubbock
High School, Silverton
High School, Odessa

Phelps & Dewees, San Antonio
Junior High School, San Antonio
San Angelo Junior College, San Angelo
Brownsville High School, Brownsville

Rittenberry & Carder, Amarillo
Educational Building, Canyon College, Canyon
High School, Vernon
High School, Lockney

Milton W. Scott & Co., Waco
South Waco Junior High School, Waco
Group of four buildings, State Home for Dependent and Neglected Children, Waco
Gymnasium, High School, Waco

Paul G. Silber & Co., San Antonio
High School, Alice
Educational Building, First Presbyterian Church, Beeville
Grant School, San Antonio

Shirley Simons, Lufkin (also Tyler)
Residential Hall, College of Industrial Arts, Denton
Auditorium-Gymnasium, Nacogdoches High School, Nacogdoches
Sulphur Springs Junior High School, Sulphur Springs

Harvey P. Smith, San Antonio
Alamo Heights Elementary and Junior High School, Alamo Heights, San Antonio
Los Angeles Heights High School, San Antonio
Dormitory, Lutheran Concordia College, Austin

Smith & Praeger, Paris
Paris Junior College, Paris
High School, Mt. Pleasant
Ward School, Paris

R. D. Steele, Houston
Sidney Lanier Junior High School, Houston
Jack Yates Colored High School, Houston
Southmore Elementary School, Houston

Maurice J. Sullivan, Houston
Convent of the Good Shepherd, Houston
James S. Hogg Junior High School, Houston (with B. P. Briscoe)
Jefferson Davis High School, Houston (with B. P. Briscoe)

W. A. Tackett & Sons Co., Abilene
High School, Bledsoe
High School, Gainesville
High School, Plano

Voelcker & Dixon, Wichita Falls
Zundelowitz Junior High School, Wichita Falls
High School, Olney
High School, Henrietta

R. Newell Waters, Weslaco
Lasara School, Lasara
Weslaco School, Weslaco
Mercedes School, Mercedes

Wm. Ward Watkin, Houston
Laboratory of Chemistry, Rice Institute, Houston
Six Junior and Senior High Schools, Houston
Texas Technological College Group, Lubbock

Witt, Seibert & Halsey, Texarkana (also Texarkana, Ark.)
Junior College, Texarkana
High School, Texarkana
Practice Building and Library, State Teachers College, Conway, Ark.

UTAH

Ashton & Evans, Salt Lake City
Irving Junior High School, Salt Lake City
Gymnasium and Auditorium, Payson
Gymnasium and Mechanical Arts Building, Magna

Cannon & Fetzer, Salt Lake City
West High School, Salt Lake City
Grantsville High School, Grantsville
Central Building, University of Utah, Salt Lake City

Hodgson & McClenahan, Ogden
Washington Junior High School, Ogden
Lincoln Elementary School, Ogden
Polk Elementary School, Ogden

Joseph Nelson, Provo
Heber J. Grant Library, Brigham Young University, Provo
Provo High School, Provo
Delta High School, Delta

Eber F. Piers, Ogden
Central Junior High School, Ogden
St. Joseph's Parochial School, Ogden
West Weber Grade School, Ogden

Scott & Welch, Salt Lake City
South Senior High School, Salt Lake City
Central School, Tooele
Bingham High School, Bingham

VERMONT

Frank Lyman Austin, Burlington
Nazareth School, Burlington
Junior High School, Burlington
Shelburne High School, Shelburne

Arthur H. Smith, Rutland
Administration Building and Girls' Dormitory, State Normal Training School, Castleton
Grade School, Cavendish
Grade School, Florence

Walker & Walker, Montpelier
Spaulding High School addition, Barre
Alumni Hall, Norwich University, Northfield
Arlington School, St. Johnsbury

VIRGINIA

Fred A. Bishop, Richmond
Blackstone College for Girls, Blackstone
Hopewell High School, Hopewell
Dupont Elementary School, Hopewell

Carneal, Johnston & Wright, Richmond
Group for Virginia Polytechnic Institute, Blacksburg
Group for Virginia Military Institute, Lexington

T. J. Collins & Son, Staunton
Memorial Hall, Staunton Military Academy, Staunton
Gymnasium and Swimming Pool, Augusta Military Academy, Fort Defiance
Gymnasium Building, Fairfax Hall, Waynesboro

Frye & Stone, Roanoke
Gymnasium, Roanoke College, Salem
Dormitory, State Teachers College, Farmville
Lucy Addison High School, Roanoke

Clarence B. Kearfott, Bristol
New group of buildings, Arlington Hall (School for Girls), Arlington County
Science Hall and Literary Group, Virginia Intermont College, Bristol
Appalachia High School, Appalachia

S. J. Makielski, Charlottesville
Academic Building, Voorhees School, Denmark, S. C.
Dormitories, Voorhees School, Denmark, S. C.
Academic Building, St. Marys School, Memphis, Tenn.

Charles M. Robinson, Richmond
Thomas Jefferson High School, Richmond
Williamsburg School, Williamsburg
Washington Hall and Library Building, College of William and Mary, Williamsburg

Louis Philippe Smithey, Roanoke
Wasena School, Roanoke
Addition to Jackson Junior High School, Roanoke
Addition to National Business College, Roanoke

WASHINGTON

Baker, Vogel & Roush, Seattle
Washington High School, Pasco
Factoria Grade School, King County
College Building, Aoyama, Tokyo, Japan

Bebb & Gould, Seattle
Group of eleven academic buildings and Library, University of Washington, Seattle
Washington State Normal School Group and Library, Bellingham
St. Nicholas Private School for Girls, Seattle

Chas. I. Carpenter, Spokane
New group of buildings, Ellensburg State Normal School, Ellensburg: Dormitories, Dining Hall, Library and Gymnasium

Wm. W. deVeaux, Yakima
Madison Grade School, Yakima
Selah High School, Selah
Addition to Garfield Grade School, Yakima

T. F. Doan, Bellingham
Washington School, Bellingham
Sunny Land School, Bellingham
Birchwood School, Bellingham

John Graham, Seattle
Physics Hall, University of Washington, Seattle
Aeronautics Hall, University of Washington, Seattle
Providence School of Nursing, Seattle

Hill, Mock & Morrison, Tacoma
Morton McCarver Intermediate High School, Tacoma
Reconstruction of Puyallup High School and addition to Junior High School, Puyallup
Clover Park Junior High School, Pierce County

Wm. Mallis, Seattle
Tahoma High School, Maple Valley
Auburn High School, Auburn
Kent High School, Kent

John W. Maloney, Yakima
Franklin Junior High School, Yakima
Sunnyside Grade School, Sunnyside
St. Patrick's Parish School, Walla Walla

F. A. Naramore, Seattle
James Madison Intermediate School, Seattle
Grover Cleveland Intermediate and Junior High School, Seattle
Whittier Elementary School, Seattle

G. H. Pehrson, Spokane
Priest River School, Priest River
School of the Holy Ghost and St. Anthony, Spokane
Reardan School, Reardan

George M. Rasque, Spokane
Coeur d'Alene Junior High School, Coeur d'Alene, Idaho
Odessa High School, Odessa
Colville High School, Colville

Francis P. Rooney, Spokane
House of the Good Shepherd, Spokane
St. Johns Academy, Colfax
St. Patrick's School, Hilliard

Stanley A. Smith, College Architect, Pullman
Group of buildings, State College of Washington, Pullman: The Commons, Men's Gymnasium and Home Economics Building

Stephen & Brust, Seattle
Mt. Vernon High School, Mt. Vernon
Port Angeles High School, Port Angeles
Sedro Woolley High School, Sedro Woolley

Fred B. Stephen, Seattle
Edmonds Grade School, Edmonds
Port Townsend Junior High School, Port Townsend
Port Orchard High School, Port Orchard

Whitehouse & Price, Spokane
West Valley High School, Millwood
Arlington Grade School, Hillyard, Spokane
Russell Grade School, Moscow, Idaho

Jos. H. Wohleb, Olympia
William Winlock Miller High School, Olympia
Irene S. Reed High School, Shelton
Garfield Grade School, Olympia

WEST VIRGINIA

Levi J. Dean, Huntington
Kenova High School, Kenova
Matewan High School, Matewan
Chesapeake High School, Chesapeake, Ohio

William Francis Diehl, Huntington
Douglas Senior and Junior High School, Huntington
Grant High School, Grant District, Cabell County, Milton
Gymnasium and Physics Education Building, Morris Harvey College, Barboursville

S. W. Ford, Clarksburg
Mannington High School, Mannington
Bridgeport High School, Bridgeport
Eagle District High School, Lumberport

Frampton & Bowers, Huntington
Martinsburg High School, Martinsburg
High School, Surveyor
High School, Pineville

Edward Bates Franzheim, Wheeling
Warwood High School, Wheeling
Chemistry Building, Bethany College, Bethany
Colored Grade School, Triadelphia

Garry & Sheffey, Bluefield
Institute Grade School, Beckley
Bramwell Grade School, Bramwell
Ramsey Junior High School, Bluefield

E. C. Holmboe, Clarksburg
Kelley Miller High School, Clarksburg
Washington Irving High School, Clarksburg
Charles Town High School, Charles Town

Alexander B. Mahood, Bluefield
Welch High School, Welch
Beaver High School, Bluefield
Classroom and Administration Building, Bluefield Institute, Bluefield

Carl Reger, Morgantown
Upshur County High School, Buckhannon
Agnes Howard Hall, West Virginia Wesleyan College, Buckhannon
St. Peters R. C. Parochial School, Fairmont

Warne, Tucker, Silling & Hutchison, Charleston
Charleston Senior High School, Charleston
Woodrow Wilson Junior High School, Charleston
Administration Building, West Virginia Collegiate Institute, Institute

Edward J. Wood & Son, Clarksburg
Sutton High School, Sutton
Weston Grade School, Weston
Flemington High School, Flemington

Wysong, Bengston & Jones, Charleston
Union School, Charleston
High School, Montgomery
Ronceverte High School, Ronceverte

WISCONSIN

N. P. Backes, Milwaukee
St. Elisabeth School, Milwaukee
Holy Cross School, Milwaukee
St. John's School, Marshfield

Balch & Lippert, Madison
Three buildings, Winnebago Indian School, Neillsville
Religious Educational Building, Swiss Reformed Church, New Glarus

Peter Brust, Milwaukee
Mercy High School, Milwaukee
Ernest G. Miller Gymnasium, St. Francis Seminary, St. Francis
Holy Redeemer School, Milwaukee

Eschweiler & Eschweiler, Milwaukee
St. Jerome's School, Oconomowoc
St. Thomas Aquinas School, Milwaukee
Lake Bluff Grade School, Shorewood

Flad & Moulton, Madison
St. Mary's School, Janesville
St. Joseph's School, Racine
Nakoma School, Madison

Foeller, Shober & Berners, Green Bay
East Side High School, Green Bay
Vocational School, Green Bay
West Bend High School, West Bend

Edward J. Hancock, Eau Claire
High School, Eau Claire
High School, Whitewater
Grade School, Chippewa Falls

Herbst & Kuenzli, Milwaukee
Mount Mary College Group, Milwaukee
Wauwatosa High School Group, Wauwatosa
Shorewood High School Group, Shorewood

Ferd. L. Kronenberg, Madison
Addition to Emerson School, Madison
St. Peter's School, Beaver Dam
St. Xavier School, Cross Plains

Law, Law & Potter, Madison
West High School, Madison
Western Avenue School, Janesville
Ringold Grade School, Janesville

Merman & Skogstad, La Crosse
Second Unit, La Crosse Vocational School, La Crosse
Beloit Vocational School, Beloit
Second Unit, Logan Senior High School, La Crosse.

Oppenhamer & Obel, Green Bay
Central School, Wausau
High School, Burlington
High School, Sheboygan Falls

Parkinson & Dockendorff, La Crosse
Junior High School, South Milwaukee
Junior High School, Waukesha
Catholic Central High School, La Crosse

Arthur Peabody, Madison
Memorial Union, University of Wisconsin, Madison
Service Memorial Institutes (medical laboratory), Madison
Practice School, State Normal School, Oshkosh

Mark F. Pfaller, Milwaukee
Addition to St. Agnes Church and School Building, Milwaukee
St. Dominic's School, Sheboygan
St. Anthony's School, Milwaukee

Charles Clark Reynolds, Green Bay
West Senior High School, Green Bay
Menekaunee Elementary School, Marinette
De Pere High School, De Pere

Smith & Brandt, Manitowoc
Kiel Grade and High School, Kiel
Adams-Friendship High School, Adams
Cunningham Elementary School, Beloit

Edward F. Starck, Madison (formerly Claude & Starck)
Franklin School, Madison
Baraboo High School, Baraboo
Evansville High School, Evansville

Frank J. Stepnoski, Fond du Lac
St. John's Catholic School, Little Chute
Lincoln Junior High School, Fond du Lac
St. Peter's Ev-Luth School, Beaver Dam

Edward Tough, Madison
Dudgeon Grade School, Madison
Randall Junior High School, Madison
Watertown High School addition, Watertown

Martin Tullgren & Sons, Milwaukee
West Milwaukee High School, West Milwaukee
Humboldt Avenue Public School, Whitefish Bay
Whitefish Bay High School, Whitefish Bay

Thomas S. Van Alyea, Milwaukee
St. Johns Military Academy, Delafield:
Memorial Chapel
Hazel Wood Hall
Smythe Hall

Van Ryn & De Gelleke, Milwaukee
Central Vocational School, Milwaukee
Milwaukee University School, Milwaukee
Science Hall, Milwaukee-Downer College, Milwaukee

Carl Volkman, Eau Claire
High School, Bloomer
St. Charles Parochial School, Chippewa Falls
St. Patrick's Parochial School, Eau Claire

Guy E. Wiley, Milwaukee
George H. Walker Junior High School, Milwaukee
Lincoln High School, Milwaukee
Auditorium, Boys' Technical High School, Milwaukee

WYOMING

Wilbur A. Hitchcock, Laramie
Laramie High School, Laramie
Men's Dormitory, University of Wyoming, Laramie
Lusk High School, Lusk

CANADA

ALBERTA

W. A. Branton, Calgary
Crescent Heights High School, Calgary
Western Canada High School, Calgary
Technical High School, Calgary

E. T. Brown, Calgary
Lethbridge Collegiate School, Lethbridge
Hanna High School, Hanna
Kamloops High School, Kamloops, B. C.

Edward Underwood, Edmonton
St. Joseph's Catholic College, Edmonton
St. Edmunds R. C. Separate School, Edmonton
St. Alphonsus R. C. Separate School, Edmonton

BRITISH COLUMBIA

Bowman & Cullerne, Vancouver
Norquay School, Vancouver
Chilliwack City School, Chilliwack
Gilmore Avenue School, Burnaby

Harry W. Postle, Architect to Vancouver Board of School Trustees, Vancouver
Vancouver Technical High School, Vancouver
(Administration and Academic Building, Auditorium and Gymnasium)
Sir Mathew Begbie School, Vancouver

Sharp & Thompson, Vancouver
University of British Columbia group, Vancouver: Science and Library Group; Anglican Theological College; new Tower and Library addition

H. M. Whiddington, Cranbrook
High School, Cranbrook
Addition to Westminster School, Lethbridge, Alberta
Two Schools, Champion, Alberta

MANITOBA

Arthur A. Stoughton, Winnipeg
Arts, Science and Engineering Buildings, University of Manitoba, Winnipeg

MARITIME PROVINCES

Leslie R. Fairn, Wolfville, N. S.
Kings County Academy, Kentville, N. S.
Acadia University, Wolfville, N. S.
Pictou Central School, Pictou, N. S.

C. A. Fowler & Co., Halifax, N. S.
Sir Charles Tupper School, Halifax
St. Patrick's Girls' School, Halifax
Nova Scotia Training School, Truro

Major H. E. Gates, Halifax, N. S.
Pathological Institute, Halifax, N. S.
Victoria General Hospital and Medical School of Dalhousie University (for instruction jointly), Halifax, N. S.

H. Claire Mott, Saint John, N. B.
Department of Forestry and Geology, University of New Brunswick, Fredericton
Library Building, University of New Brunswick, Fredericton
Provincial Normal School, Fredericton

ONTARIO

John R. Boyde, Windsor
Walkerville High School, Walkerville
Brescia Hall, Western University, London
St. Peter's Seminary, London

D. J. Cameron & W. Ralston, Windsor
Windsor-Walkerville Technical School, Windsor
Galt Collegiate Institute, Galt
Kennedy Collegiate, Windsor

S. B. Coon & Son, Toronto
Stratford Collegiate School, Stratford
Gananoque Public School, Gananoque
Fergus High School, Fergus

Craig & Madill and T. R. London, Toronto
Pembroke Collegiate Institute, Pembroke
Earl Haig High School, Township of North York
Agincourt Continuation School, Agincourt

Darling & Pearson, Toronto
University of Toronto Group, Toronto: Forestry Building; Pathological Building
Trinity College School, Port Hope

G. Roper Gouinlock, Toronto
East York High School, Toronto
Port Credit High School, Toronto
Brockville Collegiate Institute, Brockville

Hutton & Souter, Hamilton
Delta Collegiate Institute, Hamilton
Cathedral High School, Hamilton
Oshawa Collegiate School, Hamilton

G. J. P. Jacques & A. S. Allaster, Windsor
St. Angela R. C. School, Windsor
High School, Athens
St. Claire R. C. School, Windsor

B. A. Jones, Kitchener
Courtland Avenue Public School, Kitchener
St. John's (separate) School, Kitchener
Sheppard Public School, Kitchener

Albert J. Lothian, Windsor
Assumption College, Classroom Building, Sandwich
St. Joseph School (public school), Ford City
St. Edward School, Sandwich

Nichols, Sheppard and Masson, Windsor
John Campbell Public School, Windsor
Gordon McGregor Public School, Ford City
Hugh Beaton Public School, Walkerville

E. H. Paisley, Toronto
St. Andrews College (for boys), Aurora
Ridley College—Lower School for Boys, St. Catherines
St. Andrews College—Lower School, Aurora

Pennington & Boyde, Windsor
Walkerville Collegiate Institute, Walkerville
Havry Guppy School, Windsor
Ford Public School, East Windsor

Richards & Abra, Ottawa
St. John's Separate School, Perth
Winchester Public School, Winchester
Broadway Avenue Public School, Westboro

William Lyon Somerville, Toronto
McMasters University Group, Hamilton: University Hall, Science Building, Men's Residence, Women's Residence, Refectory
(J. Francis Brown & Son, Toronto, Associate Architects)

Sproatt & Rolph, Toronto
Emanuel College, Victoria University, Toronto
Bishop Strachan School, Toronto
Upper Canada Lower School, Toronto

Toronto Board of Education, Architects' Department, Toronto
Western Technical-Commercial School, Toronto
Duke of York Elementary School, Toronto
Eastern High School of Commerce, Toronto

F. W. Warren, Hamilton
W. H. Ballard Public School, Hamilton
Lord Allenby School, Hamilton
Saltfleet High School, Stoney Creek

Watt & Blackwell, London (also Toronto)
University of Western Ontario, School of Medicine, London
Ryerson Public School, London
London Technical and Art School, London (A. Nutter, Associated)

John Wilson, Collingwood
Collegiate Institute, Collingwood
Addition to Collegiate Institute, Barrie
Continuation School, Erin

QUEBEC

Louis N. Audet, Sherbrooke
Mont Notre Dame Convent, Sherbrooke
Seminary, Three Rivers
(Asselin & Denoncourt, Associate Architects)
St. Mary Academy, Sherbrooke

David R. Brown, Montreal
Chemistry Building, University of Saskatchewan, Saskatoon, Saskatchewan
Field Husbandry Building, University of Saskatchewan, Saskatoon, Saskatchewan
Rosemount School, Montreal

Alcide Chaussé, Montreal
Convent, Granby
St. Brigide's School, Montreal
Maisonneuve School, Montreal

Chas. David, Montreal
St. Cunegonde Academy, Montreal
Holy Cross School, Montreal
St. Etienne School, Montreal

J. Raoul Garièpy, Montreal
Cartierville School, Montreal
Cornwall School, Cornwall, Ont.
St. Scholastic Convent, St. Scholastique

Gordon & Thompson, Montreal
West Hill High School addition, Montreal
Willingdon School, Montreal (Consulting Architect)
Barclay School, Montreal

Anastase Gravel, Verdun
Ecole Maternelle, Verdun
Couvent de Rigaud, Rigaud
Ecole Notre-Dame de Lourdes, Verdun

Lamontagne, Gravel & Brassard, Chicoutimi
Couvent du Bon Pasteur, Chicoutimi
Agrandissement du Séminaire de Chicoutimi
Couvent de Kénogami, Kénogami

Pierre Lèvesque, Quebec
Seminary of Gaspé, Gaspé
Agricultural School, Rimouski
Ursulines Convent, Gaspé

Nobbs & Hyde, Montreal
Pulp and Paper Research Institute, McGill University, Montreal
Henry J. Garritty School, Verdun
Rushbrooke School addition, Verdun

J. Aime Poulin, Sherbrooke
Ste. Therese School, Sherbrooke
Catholic High School, Drummondville
St. Maurice College, Thetford Mines

C. A. Reeves, Montreal
Academie du St. Nom de Marie, Montreal
Academie de Lasalle, Montreal
Academie Jeanne d'Arc, Montreal

Richer & Bournet, St. Hyacinthe
Seminary of St. Hyacinthe, St. Hyacinthe
Mercier School, St. Hyacinthe
Larocque School, St. Hyacinthe

Eugene St. Jean, Montreal
Ste. Cecile School, Montreal
(J. Albert Larue, Outremont, Associate Architect)
St. Vincent-Ferrier School, Montreal
(J. Albert Larue, Outremont, Associate Architect)
St. Gerard School, Montreal

Joseph Sawyer, Montreal
Ecole Normale for RR. SS. Holy Cross, Mont Laurier
Convent for RR. SS. de L'Assomption, Haileybury, Ont.
Convent for RR. SS. Holy Cross, Montreal

D. J. Spence, Montreal
Catholic High School, Montreal
Sacred Heart Convent School, Montreal
Sacred Heart Convent School, Sault au Recolet

SASKATCHEWAN

Frank P. Martin, Saskatoon
Pleasant Hill School, Saskatoon
City Park Collegiate School, Saskatoon
Victoria School addition, Saskatoon

F. H. Portnall, Regina
Thomson Public School, Regina
Davin Public School, Regina
Maple Leaf Hostel, St. Chads College, Regina

J. H. Puntin, Regina
Regina College, Music and Arts Building, Regina
Sacred Heart College and Chapel, Regina
Luther College Teaching and Administration Building, Regina

W. G. Van Egmond and Stan. E. Storey, Regina
Balfour Technical School, Regina
Collegiate Institute, Regina
Normal School, Regina

See also Landscape Architects for University and School Projects, pages 540, 541.

Recent Books on School Buildings

A Selected List Compiled for "The American School and University"

BY S. J. SMITH
FORMERLY SUPERINTENDENT OF SCHOOLS, MINERAL WELLS, TEXAS

For Better Schoolhouses.—By Fletcher B. Dresslar, S. L. Smith, Haskell Pruett, and others. Interstate School Building Service, George Peabody College, Nashville, Tenn. 1929. First edition exhausted.

This is a book of perspective sketches of school buildings, floor plans, perspectives of school grounds, suggestive specifications, and contract forms. The buildings represented are classified according to teacher capacity, ranging from one to fourteen teachers, with the greater space accorded the one-, two-, three-, and four-teacher schools. One section is devoted to community houses, teacherages and other special buildings.

The Location of City School Plants.—By L. Leland Dudley. (Harvard Bulletins in Education No. 14). Harvard University Press, Cambridge, Mass. 1929. 130 pp. $1.00.

A well-organized monograph which has drawn from current school building surveys much pertinent information and techniques necessary to the solution of school planning problems. This volume offers sound criteria for school plant planning in the selection of desirable school sites.

Planning School Building Programs.—By N. L. Engelhardt and Fred Engelhardt. Bureau of Publications, Teachers College, Columbia University, New York. 1930. 570 pp. $5.00.

A comprehensive treatise on all phases of school plant analysis. This text treats critically and completely of the techniques and principles involved in plant planning. It covers such items as site selection, cost of school sites, city planning and the plant program, architectural service and the building program, school-building costs, financing and cost of school-building programs, and many other phases of the work.

School Building Programs in American Cities.—By N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1928. 560 pp. $5.00.

This volume presents a cross-section study of school-building conditions in the United States—North, South, East, and West. It illustrates clearly by definite reference to specific cases and places how school-building programs have been developed. The variety of situations presented enables a superintendent to adapt the specific methods of study to his own local conditions.

Borrowing Money for the Public Schools.—By H. R. Halsey. Bureau of Publications, Teachers College, Columbia University. 1929. 127 pp. $1.50.

A very timely and scholarly study in the field of public school borrowing with special reference to capital outlay.

College Architecture in America.—By Charles Z. Klauder, and Herbert C. Wise. Charles Scribner's Sons, New York. 1929. 301 pp. $5.00.

Even though this book does not purport to be a book of plans, floor plans or development plans appear on some sixty pages of the book. There are equally as many pages devoted to representative samples of the types of architecture existing on the American college campus. This book presents a comprehensive discussion of the present-day theory and practice of college architecture, which is distinctly American, adapted to climate, environment, and other physical conditions, as well as to the rapidly advancing methods of collegiate education.

Public School Plant Program.—By Arthur B. Moehlman. Rand, McNally & Co., New York. 1929. 405 pp. $3.00.

This text presents authoritatively the principles underlying the organization and administration of school plant programs. A practical technique for appraising the present plant and determining the needs of the ultimate plant in a given school situation is also presented.

School Building Management.—By C. E. Reeves, and H. S. Ganders. Bureau of Publications, Teachers College, Columbia University. 1928. 395 pp. $3.75.

This is the first comprehensive book that has yet become available that covers the care and operation of school buildings. It is a manual and book of reference for those who are responsible for the maintenance of school-building conditions at a high level. It gives standards for measuring the efficiency of operation, and concrete help that will facilitate the work of janitor-engineers and other employees about a school plant.

Economy in Public School Fire Insurance.—By Harvey A. Smith. Bureau of Publications, Teachers College, Columbia University. 1930. $1.50.

A most comprehensive and thoroughgoing study which shows school administrators how to insure school buildings and how to plan school buildings so that insurance costs are low.

A Bibliography of School Buildings, Grounds, and Equipment.—By Henry Lester Smith, and Leo Martin Chamberlain. Bulletin of the School of Education, Indiana University, Bloomington, Ind. Vol. IV, No. 3, January, 1928. 326 pp. 75 cents.

This selected annotated bibliography is well indexed and classified and more complete than any similar bibliography published up to this time. It is a valuable volume for persons interested in problems of school-plant selection, design, construction, or management.

See also Books and Pamphlets Issued by State Departments of Education with Special Reference to School-Building Planning and Construction, page 320.

Section XIV

LANDSCAPE ARCHITECTS
FOR UNIVERSITY AND SCHOOL PROJECTS

The following directory is restricted to fellows or members of the American Society of Landscape Architects who are in independent professional practice and have actually been identified with a number of university or school projects.

Space limitations permit only three listings for each individual or firm, and preclude mentioning either the name of the architect associated or the definite character of the work undertaken for each institution. It is believed that the majority of landscape architects specializing in school and university work are here represented, and that many of the projects listed have had a considerable influence on high-grade professional practice in the planning and planting of school grounds and college campuses throughout the United States.

ALABAMA

R. J. Pearse & Associates, Birmingham
University of Mississippi, Oxford, Miss.
East Mississippi Junior College, Scooba, Miss.
Roosevelt High School, Des Moines, Ia.

CALIFORNIA

Stephen Child, San Francisco
Lowthorpe School of Landscape Architecture for Women, Groton, Mass.
Convalescent Home, Children's Hospital, Wellesley, Mass.
State Normal School, Teachers College, San Jose

Cook, Hall & Cornell, Los Angeles
Pomona College, Claremont
Claremont Colleges, Claremont
University of Hawaii, Honolulu

Charles H. Diggs, Los Angeles
Georgetown University Preparatory School, Washington, D. C.
Mount Vernon Seminary, Washington, D. C.
University of Southern California, Los Angeles

Frederick N. Evans, Sacramento
Sacramento Junior College Campus, Sacramento
Sacramento Public Schools Grounds, Sacramento
Woods Grammar School, Woodbridge

Howard Gilkey, Oakland
St. Mary's College, Moraga
Mills College, Oakland
Modesto Junior College, Modesto

John William Gregg, Berkeley and Los Angeles
Campus development for the University of California at Berkeley, Los Angeles, Riverside and Davis
Los Angeles High School Campus, Los Angeles
California State School for Boys, Whittier

McKown and Kuehl, Beverly Hills
Iowa State Teachers' College, Cedar Falls, Iowa
Public Schools, Davenport, Iowa
Huntington Beach Union High School, Huntington Beach

Emanuel Tillman Mische, Los Angeles
Warren G. Harding High School, Sawtelle
El Segundo High School, El Segundo
Beverly Hills High School, Beverly Hills

L. Deming Tilton, Santa Barbara
University of Illinois, Urbana, Ill.
State Teachers College, Santa Barbara
Saint Anthony's College, Santa Barbara

Paul G. Thiene, Los Angeles
Alhambra High School, Alhambra
Santa Maria Union High School, Santa Maria
Excelsior Union High School, Norwalk

COLORADO

S. R. DeBoer, Denver
University of Denver, Denver
Colorado Woman's College, Denver
The Idaho Technical Institute, Pocatello, Idaho

McCrary, Culley & Carhart, Denver
University of Colorado, Boulder
University of Utah, Salt Lake City, Utah
Oklahoma A. & M. College, Stillwater, Okla.

CONNECTICUT

Thomas H. Desmond & Associates, Inc., Simsbury
Westminster School, Simsbury
Miss Porter's School, Farmington
Ethel Walker School, Simsbury

FLORIDA

Frank M. Button, Coral Gables
University of Vermont, Burlington, Vt.
Ponce de Leon High School, Coral Gables
Millikin University, Decatur, Ill. (Partner of Simonds Co.)

ILLINOIS

Jacob L. Crane, Jr., Chicago
Lawrence College Campus, Appleton, Wis.
High School Campus, Ponca City, Okla.
Chicago Board of Education (64 schools)

Chance S. Hill, Chicago
North Central College Campus, Naperville
Downers Grove Community High School, Downers Grove
Wheaton Community High School, Wheaton

F. A. Cushing Smith & Associates, Chicago
High School Group, Shorewood, Milwaukee, Wis.
St. Joseph's Seminary, Hinsdale
Glenwood Manual Training School, Glenwood

Simonds & West, Chicago
Iowa State College, Ames, Iowa
Illinois College, Jacksonville
Millikin University, Decatur

INDIANA

Lawrence V. Sheridan, Indianapolis
St. Mary of the Woods Academy, Terre Haute
Butler University, Indianapolis
Purdue University, Lafayette

IOWA

Philip H. Elwood, Jr., Ames
State University of Iowa, Iowa City
State School for the Deaf, Council Bluffs
Dorothy Love Presbyterian Home, Sidney, Ohio

MASSACHUSETTS

Mabel Keyes Babcock, Boston
Wellesley College Campus, Wellesley
Massachusetts Institute of Technology, Cambridge
Bates College, Lewiston, Maine

Robert Washburn Beal, Boston
Brockton High School, Brockton
Bowdoin College, Bowdoin Athletic Field, Brunswick, Maine
High School Campus and Athletic Field, Whitman

Harold Hill Blossom, Boston
Beaver Country Day School, Brookline
Amherst College, Amherst
Dedham High School, Dedham

Herbert J. Kellaway, Boston
Amherst College, Amherst
Andover Theological Seminary, Cambridge
Hartford Theological Seminary, Hartford, Conn.

H. V. Lawrence, Falmouth
Chicopee High School, Chicopee
Fitchburg Normal School, Fitchburg
University of Cincinnati, Cincinnati, Ohio

Warren H. Manning Offices, Inc., Cambridge
University of Virginia, Charlottesville, Va.
Western Reserve University, Cleveland, Ohio
North Carolina State College, Raleigh, N. C.

Hallam L. Movius, Boston
Beaver Country Day School, Brookline
University of Buffalo, Buffalo, N. Y.
Dalton High School, Dalton

Sam P. Negus, Boston
Notre Dame Academy, Roxbury
St. Gabriel's Parish School, Washington, D. C.
Boston College, Chestnut Hill

John Nolen, Cambridge
Babson Institute, Wellesley
Queens College, Charlotte, N. C.
University of Wisconsin, Madison, Wis.

Olmsted Brothers, Brookline
Phillips Academy, Andover
Denison University, Granville, Ohio
Duke University, Durham, N. C.
Bremer Whidden Pond, Boston
University of New Hampshire, Durham, N. H.
Colgate University, Hamilton, N. Y.
Southern Methodist University, Dallas, Texas
William H. Punchard, Boston
Middlebury College, Middlebury, Vt.
Abbot Academy, Andover
Woburn High School Athletic Field, Woburn
Arthur A. Shurtleff, Boston
Amherst College, Amherst
Wellesley College, Wellesley
Mount Holyoke College, South Hadley
Stiles & Van Kleek, Boston
Williams College (golf course), Williamstown
Tufts College (golf course), Medford
Taft School (golf course), Watertown, Conn.
Loring Underwood and Laurence S. Caldwell, Boston
Vassar College, Poughkeepsie, N. Y.
Bates College, Lewiston, Maine
Belmont High School, Belmont
Walker, Walker & Kingsbury, Boston
Chicopee High School, Chicopee
Washington Irving School, Boston
The Thomas School, Rowayton, Conn.
Frank A. Waugh, Amherst
Massachusetts Agricultural College, Amherst
Kansas State Agricultural College, Manhattan, Kans.
New York State Agricultural College, Geneva, N. Y.

MICHIGAN

T. Glenn Phillips, Detroit
Michigan State College, East Lansing
Sacred Heart Seminary, Detroit
University of Detroit, Detroit
Pinner & Wilcox, Detroit
Detroit Industrial School, Detroit
Schenley High School, Pittsburgh
Grosse Pointe High School, Grosse Pointe
Aubrey Tealdi, Ann Arbor
Hillsdale Public Schools, Hillsdale
St. Clair High School, St. Clair
University of Michigan, Ann Arbor
H. O. Whittemore, Ann Arbor
Tappan Junior High School, Ann Arbor
Mack Junior High School, Ann Arbor
Hematite Township High School, Amasa

MINNESOTA

Morell & Nichols, Inc.
University of Minnesota, Minneapolis
Washington State College, Pullman, Wash.
Carleton College, Northfield, Minn.
Charles H. Ramsdell, Minneapolis
Rhinelander High School and Recreational Centre, Rhinelander, Wis.
Rochester Schools, Rochester
Three camp site developments, Minneapolis Y. M. C. A., Minneapolis

MISSOURI

Hare & Hare, Kansas City
University of Kansas, Lawrence, Kans.
High School Campus, Longview, Wash.
8 Senior and Junior High Schools, Houston, Texas
John Noyes, St. Louis
New Mary Institute, St. Louis County
Washington University, St. Louis
Westminster College, Fulton

NEW JERSEY

Marjorie Sewell Cautley, Ridgewood
Fieldston School Campus, New York City
Tenafly High School Grounds, Tenafly
Roosevelt Common Athletic Field, Tenafly

NEW YORK

A. F. Brinckerhoff, New York
Middlebury College, Middlebury, Vt.
Bronxville Schools, Bronxville
Tuckahoe High School, Tuckahoe
Brinley & Holbrook, New York
Columbia High School, Maplewood, N. J.
Grammar Schools, Maplewood, N. J.
High School Campus, Asbury Park, N. J.
Laurie D. Cox, Syracuse
Acadia University, Wolfville, Nova Scotia
New York State College of Forestry, Syracuse
Mamaroneck High School, Mamaroneck
Mrs. Beatrix Farrand, New York
Yale University, New Haven, Conn.
Princeton University, Princeton, N. J.
The Hill School, Pottstown, Pa.
Bryant Fleming, Ithaca
Cornell University, Ithaca
Dennison University, Granville, Ohio
Toronto University, Toronto, Canada
Francis Hastings Gott, Rochester
Nazareth Convent and Academy, Pittsford
Batavia (athletic field), Batavia
Allen's Creek School, District No. 6, Brighton
Roeder J. Kinkel, Buffalo
Evangelical Training School, Dunkirk
Batavia High School, Batavia
Masten Park High School, Buffalo
Charles Downing Lay, New York
New York State Normal Training School, Cortland
Newburgh Free Academy, Newburgh
Waterbury High School, Waterbury, Conn.
Charles Wellford Leavitt & Sons, New York
Tome Institute, Port Deposit, Md.
Lehigh University, Bethlehem, Pa.
University of South Carolina, Columbia, S. C.
H. B. Littlefield, Bronxville
High School of White Plains, and Stadium, White Plains
Presbyterian Church Day Bible School, White Plains
Horace Greeley High and Graded School, Chappaqua
Charles N. Lowrie, New York
Yale University, New Haven, Conn.
Lawrenceville School, Lawrenceville, N. J
State School for the Deaf, Trenton, N. J.
Carl F. Pilat, New York
Carteret Academy, Orange, N. J.
Ossining School, Ossining
Junior and Senior High School, Englewood, N. J.
Richard Schermerhorn, Jr., New York
Rensselaer Polytechnic Institute, Troy
Union College, Schenectady
St. Anthony's Seraphic Seminary, Catskill
Roland Schultheis, Flushing
De Witt Clinton High School, Bronx
High School, Far Rockaway
Grammar School, Forest Hills, L. I.
Ferruccio Vitale—Alfred Geiffert, Jr., New York
University of Illinois, Urbana, Ill.
Pleasantville High School, Pleasantville
Virginia Military Institute, Lexington, Va.

NORTH CAROLINA

E. S. Draper, Charlotte
Winthrop College, State College for Women, Rock Hill, S. C.
Furman University, Greenville, S. C.
Davidson College, Davidson

OHIO

A. D. Taylor, Cleveland
Carnegie Institute of Technology, Pittsburgh, Pa.
Oregon Agricultural College, Corvallis, Ore.
Mount Union College, Alliance
B. Ashburton Tripp, Cleveland
High School, Parkersburg, W. Va.
High School, Shaker Heights
High School, Cleveland Heights

PENNSYLVANIA

Harry B. Hostetter, Lancaster
Reformed Theological Seminary, Lancaster
Linden Hall Seminary for Girls, Lititz
Hamburg High School, Hamburg
Thomas W. Sears, Philadelphia
Johns Hopkins University, Baltimore, Md.
Pennsylvania State College, State College, Pa.
Durham High School, Durham, N. C.
Wheelwright & Stevenson, Philadelphia
Scarsdale High School, Scarsdale, N. Y.
The Gunnery School, Washington, Conn.
Berkshire School, Sheffield, Mass.

VIRGINIA

Charles F. Gillette, Richmond
College of William and Mary, Williamsburg
La Salle Peru High School, La Salle, Ill.
State Normal School, Fayetteville, N. C.

WISCONSIN

Phelps Wyman, Milwaukee
State School of Mines, Rapid City, S. Dak.
University of North Dakota, Grand Forks, N. Dak.
Normal School, La Crosse

CANADA

Arthur M. Kruse, Toronto, Ontario
The Boys' Training School, Bowmanville, Ontario
Woodstock College, Woodstock, Ontario
Belleville Institution for the Deaf, Belleville, Ontario
Rickson A. Outhet, Montreal, Quebec
Macdonald Agricultural College, St. Anne de Belleville, Quebec
Knowlton Conference Grounds, Knowlton, Quebec
Kings School, Westmount, Quebec

Section XV

SUPERINTENDENTS OF SCHOOLS IN PLACES OF 5,000 POPULATION AND OVER

In the following list are included all of the cities having, according to the 1920 Federal Census, a population of 5,000 or over. The names of the superintendents of schools have been revised to March, 1930.

City	*Superintendent*
Alabama	
Alabama City	J. C. Floyd
Anniston	S. E. Alverson
Bessemer	J. E. Bryan
Birmingham	C. B. Glenn
Decatur	W. W. Benson
Dothan	C. C. Moseley
Fairfield	B. B. Baker
Florence	F. T. Appleby
Gadsden	C. A. Donehoo
Huntsville	W. G. Hamm
Mobile	W. C. Griggs
Montgomery	W. R. Harrison
Phenix City	L. P. Stough
Selma	P. M. Munroe
Sheffield	L. E. Creel
Talladega	Judson Snead
Troy	L. D. Bynum
Tuscaloosa	J. M. Burnett
Arizona	
Bisbee	George E. Brown
Douglas	J. E. Carlson, Jr.
Globe	F. E. Webb
Miami	C. K. Davis
Morenci	W. E. Lutz
Nogales	A. J. Mitchell
Phoenix	John D. Loper
Prescott	Edward F. Honn
Tucson	C. E. Rose
Arkansas	
Blytheville	Crawford Greene
Fayetteville	Frank S. Root
Fort Smith	J. W. Ramsey
Helena	J. F. Wahl
Hot Springs National Park	Harvey H. Haley
Jonesboro	Fred Keller
Little Rock	R. C. Hall
Marianna	O. T. Conner
No. Little Rock	W. E. Phipps
Paragould	J. Will Pierce
Pine Bluff	J. R. Allen
Texarkana	P. N. Bragg
Van Buren	D. M. Riggin
West Helena	R. A. Cooper
California	
Alameda	Wm. G. Paden
Alhambra	F. V. Routt
Bakersfield	L. E. Chenoweth
Berkeley	Lewis W. Smith
Brawley	D. S. Richmond
Calexico	D. P. Choisser
Chico	C. H. Camper
El Centro	B. M. Gruwell
Eureka	G. B. Albee
Fresno	O. S. Hubbard
Glendale	R. D. White
Hanford	C. E. Denham
Long Beach	W. L. Stephens
Los Angeles	F. A. Bouelle
Marysville	W. A. Kynoch
Modesto	J. H. Bradley
Monrovia	A. R. Clifton
Monterey	J. H. Graves
Napa	E. E. Crawford
Oakland	W. E. Givans
Ontario	C. W. Randall
Palo Alto	A. C. Barker
Pasadena	J. A. Sexson
Petaluma	B. H. Painter
Pomona	Emmett Clark
Redlands	H. G. Clement
Richmond	W. T. Helms
Riverside	I. C. Landis
Sacramento	C. C. Hughes
San Bernardino	C. R. Holbrook
San Diego	W. R. Hepner
San Francisco	J. M. Gwinn
San Jose	W. L. Bachrodt
San Leandro	W. O. Davies
San Luis Obispo	C. E. Teach
San Mateo	G. W. Hall
San Rafael	O. R. Hartzell
Santa Ana	J. A. Cranston
Santa Barbara	P. E. Stewart
Santa Clara	C. W. Townsend
Santa Cruz	K. F. Adams
Santa Monica	F. F. Martin
Santa Rosa	J. O. Cross
South Pasadena	G. C. Bush
Stockton	A. S. Williams
Vallejo	E. L. Cave
Visalia	De Witt Montgomery
Watsonville	T. S. MacQuiddy
Whittier	S. H. Thompson
Colorado	
Boulder	W. V. Casey
Colorado Springs	H. M. Corning
Denver	A. L. Threlkeld
Fort Collins	A. H. Dunn
Grand Junction	R. E. Tope
Greeley	I. E. Stutesman
Longmont	C. C. Casey
Loveland	R. W. Truscott
Pueblo	District No. 1, J. H. Risley; District No. 20, J. F. Keating
Sterling	R. R. Knowles
Trinidad	G. S. Willey
Connecticut	
Ansonia	R. T. Tobin
Bridgeport	Worcester Warren
Bristol	K. A. Reiche
Danbury	F. K. Watson
Derby	F. M. Buckley
East Hartford	P. S. Barnes
Enfield	E. H. Parkman
Fairfield	W. E. Smith
Glastonbury	F. S. Knox
Greenwich	E. C. Andrews
Hamden	Margaret L. Keefe
Hartford	F. D. Wish, Jr.
Killingly	W. E. Parker
Manchester	9th District, F. A. Verplanck; Town Schools, A. F. Howes
Meriden	C. C. Thompson
Middletown	F. W. Shearer (acting)
Milford	C. W. Maddocks
Naugatuck	H. E. Chittenden
New Britain	S. H. Holmes
New Haven	F. H. Beede
New London	W. A. Hanson
Norwalk	John Lund
Norwich	E. J. Graham
Orange	John H. Hinchliffe
Plainfield	J. L. Chapman
Plymouth	H. S. Fisher
Putnam	L. M. Farrin
Seymour	R. C. Clark
Shelton	H. E. Fowler
Southington	H. S. Libby
Stafford	F. S. Brick
Stamford	J. A. Ewart
Stonington	W. R. Snyder
Stratford	E. W. Ireland
Thompson	W. G. Colby
Torrington	G. J. Vogel
Vernon	H. O. Clough
Wallingford	H. M. Jeffords
Waterbury	M. C. Donovan
Watertown	G. C. Swift
West Hartford	L. H. Bugbee
Westport	M. R. Lefier
Winchester	L. R. McKusick
Windham	E. A. Case
Windsor	Daniel Howard
Delaware	
Wilmington	S. M. Stouffer
District of Columbia	
Washington	Frank W. Ballou
Florida	
Daytona Beach	G. W. Marks
Fernandina	O. T. Weaver
Gainesville	E. R. Simmons
Jacksonville	R. B. Rutherford
Key West	M. E. Russell
Lakeland	T. T. Hatton
Miami	C. M. Fisher
Orlando	A. B. Johnson
Palatka	C. H. Price
Pensacola	Wm. Tyler
St. Augustine	C. G. Oldfather
St. Petersburg	G. M. Lynch
Sanford	T. W. Lawton
Tallahassee	F. S. Hartsfield
Tampa	W. D. F. Snipes
W. Palm Beach	J. A. Youngblood
Georgia	
Albany	R. E. Brooks
Americus	J. E. Mathis
Athens	B. M. Grier
Atlanta	W. A. Sutton
Augusta	L. B. Evans
Brunswick	R. D. Eadie
Columbus	R. B. Daniel
Cordele	D. H. Standard
Dalton	J. I. Allman
Decatur	Lamar Ferguson
Dublin	Knox Walker
East Point	J. A. Wells
Elberton	T. N. Gaines
Fitzgerald	G. E. Usher
Gainesville	W. P. Martin
Griffin	L. M. Lester
Lagrange	F. F. Rowe
Macon	W. P. Jones
Marietta	C. A. Keith
Moultrie	J. L. Yaden
Newnan	C. B. Mathews
Rome	B. F. Quigg
Savannah	O. B. Strong
Thomasville	B. B. Broughton
Valdosta	A. G. Cleveland
Waycross	Ralph Newton

City	Superintendent
Idaho	
Boise	C. F. Dienst
Burley	D. T. Williams
Caldwell	F. P. Baird
Coeur d'Alene	J. J. Rae
Idaho Falls	R. H. Snyder
Lewiston	G. W. Todd
Nampa	J. E. Walsh
Pocatello	J. M. McDonald
Twin Falls	W. B. Smith
Illinois	
Alton	W. R. Curtis
Aurora	K. D. Waldo (East Side)
	A. A. Rea (West Side, Acting)
Beardstown	W. L. Gard
Belleville	H. V. Calhoun
Belvidere	R. E. Garrett
Benton	M. J. Carlton
Berwyn	Wm. Hawkes (No. 98)
	E. W. Martin (No. 100)
Bloomington	S. K. McDowell
Blue Island	J. E. Lemon
Cairo	J. W. Carrington
Calumet City	J. A. Wieland
Canton	R. W. Hyndman
Carbondale	A. R. Boone
Carlinville	H. J. Blue
Centralia	R. V. Jordan
Champaign	L. N. Neulen
Charleston	W. W. Ankenbrand
Chicago	W. J. Bogan
Chicago Heights	F. T. Goodier
Cicero	G. A. Schwebel
Clinton	Arthur Verner
Collinsville	C. H. Dorris
Danville	C. E. Vance
Decatur	Wm. Harris
De Kalb	F. W. Phillips
Dixon	I. B. Potter
Duquoin	Joe Strickler
East Moline	D. B. Hoffman
East St. Louis	D. W. Potts
Edwardsville	C. F. Ford
Eldorado	J. W. Allen
Elgin	R. W. Fairchild
Evanston	J. R. Skiles (No. 75)
	F. W. Nichols (No. 76)
Forest Park	R. C. Mueller
Freeport	B. F. Shafer
Galesburg	O. O. Young
Granite City	L. P. Frohardt
Harrisburg	Roscoe Pulliam
Harvey	F. L. Miller
Herrin	J. R. Creek
Highland Park	J. L. Smith (No. 107)
	C. G. Wright (No. 108)
Hillsboro	H. J. Beckemeyer
Hoopeston	W. R. Lowery
Jacksonville	Ralph Yakel
Joliet	H. A. Perrin
Kankakee	A. P. Johnson
La Grange	J. C. Davies
La Salle	J. B. McManus
Lawrenceville	M. N. Todd
Lincoln	D. F. Nichols
Litchfield	A. J. Black
Macomb	G. A. Selters
Marion	H. O. Belford
Mattoon	H. B. Black
Maywood	Eugene La Rowe
Melrose Park	Edna Moncreiff
Metropolis	C. J. Ramsay
Moline	L. A. Mahoney
Mount Carmel	R. S. Condrey
Mount Vernon	William Miner
Murphysboro	Sidna Mullineaux
Normal	Monroe Melton
North Chicago	F. E. Deyoe (Dist. No. 63)
	R. L. Newenham (Dist. No. 64)
Oak Park	W. J. Hamilton
Ottawa	C. J. Byrne
Pana	J. L. Hart
Paris	J. R. Moss
Pekin	C. B. Smith
Peoria	E. C. Fisher
Peru	A. H. Karn
Pontiac	A. F. Speltz
Quincy	J. H. Steiner
Rockford	F. A. Jensen
Rock Island	J. J. Hagan
Savanna	I. I. Meyer
Springfield	J. H. Winstrom
Spring Valley	C. L. Sarver
Staunton	H. A. Sparr
Sterling	H. U. Challand (Dist. No. 10)
	O. A. Fackler (Dist. No. 11)
Streator	H. B. Fisher
Taylorville	J. B. Hendricks
Urbana	T. H. Cobb
Waukegan	J. S. Clark
West Frankfort	C. A. Waller
Wilmette	J. R. Harper
Winnetka	C. W. Washburne
Woodstock	E. C. O. Beatty
Zion	
Indiana	
Anderson	W. A. Denny
Bedford	M. J. Abbett
Bicknell	Harold Axe
Bloomington	R. N. Tirey
Bluffton	O. M. Craig
Brazil	C. P. Keller
Clinton	G. W. McReynolds
Columbus	Donald Du Shane
Connersville	E. C. Dodson
Crawfordsville	A. D. Montgomery
East Chicago	J. G. Rossman
Elkhart	J. F. Wiley
Elwood	W. F. Smith
Evansville	J. O. Chewning
Fort Wayne	L. C. Ward
Frankfort	J. W. Stott
Gary	W. A. Wirt
Goshen	J. W. Foreman
Greensburg	E. C. Jerman
Hammond	L. L. Caldwell
Hartford City	H. P. Kelsay
Huntington	J. M. Scudder
Indianapolis	C. F. Miller
Jeffersonville	E. G. McCullum
Kendallville	H. M. Dixon
Kokomo	C. V. Haworth
La Fayette	A. E. Highley
La Porte	E. B. Wetherow
Lebanon	Paul Van Riper
Linton	T. J. Beecher
Logansport	D. W. Horton
Madison	E. O. Muncie
Marion	E. E. Day
Michigan City	M. C. Murray
Mishawaka	P. C. Emmons
Mount Vernon	M. N. O'Bannon
Muncie	F. E. Allen
New Albany	H. A. Buerk
Newcastle	E. J. Llewellyn
Peru	G. W. Youngblood
Portland	J. C. Webb
Princeton	G. E. Derbyshire
Richmond	W. G. Bate
Rushville	H. B. Allman
Seymour	N. J. Lasher
Shelbyville	W. F. Vogel
South Bend	W. W. Borden
Terre Haute	G. C. Carroll
Valparaiso	C. W. Boucher
Vincennes	V. L. Eikenberry
Wabash	O. J. Neighbours
Warsaw	J. M. Leffel
Washington	J. H. Shipp
Whiting	J. H. Hoskinson
Iowa	
Albia	W. H. Fasold
Ames	M. G. Davis
Atlantic	J. P. Street
Boone	G. S. Wooten
Burlington	W. G. Brooks
Cedar Falls	F. L. Mahannah
Cedar Rapids	Arthur Deamer
Centerville	E. W. Fannon
Chariton	J. R. Cougill
Charles City	P. C. Lapham
Cherokee	N. D. McCombs
Clinton	C. W. Brown
Council Bluffs	Theodore Saam
Creston	G. E. De Wolf
Davenport	F. L. Smart
Des Moines	J. W. Studebaker
Dubuque	F. G. Stevenson
Fairfield	W. G. Pence
Fort Dodge	K. D. Miller
Fort Madison	A. I. Tiss
Grinnell	C. E. Humphrey
Iowa City	I. A. Opstad
Keokuk	R. L. Reid
Marshalltown	W. F. Shirley
Mason City	F. T. Vasey
Muscatine	E. A. Sparling
Newton	B. C. Berg
Oelwein	G. B. Ferrell
Oskaloosa	R. B. Newman
Ottumwa	R. F. Hannum
Perry	Agnes E. Heightshoe
Red Oak	J. R. Inman
Shenandoah	H. M. Taylor
Sioux City	M. G. Clark
Waterloo	C. W. Cline (East Side)
	C. A. Kittrell (West Side)
Webster City	J. E. Smith
Kansas	
Arkansas City	C. E. St. John
Atchison	W. D. Wolfe
Chanute	L. H. Petit
Coffeyville	A. I. Decker
Dodge City	W. M. Richards
Eldorado	J. F. Hughes
Emporia	L. A. Lowther
Fort Scott	V. M. Liston
Hutchinson	J. W. Gowans
Independence	J. H. Clement
Iola	A. M. Thoroman
Junction City	E. L. Novotny
Kansas City	M. E. Pearson
Lawrence	W. W. Curfman
Leavenworth	I. J. Bright
Manhattan	W. E. Sheffer
Newton	J. B. Heffelfinger
Ottawa	A. F. Senter
Parsons	R. E. Hughes
Pittsburg	M. M. Rose
Pratt	W. A. Wood
Salina	W. S. Heusner
Topeka	A. J. Stout
Wellington	A. M. McCullough
Wichita	L. W. Mayberry
Winfield	W. W. McConnell
Kentucky	
Ashland	J. D. Falls
Bellevue	L. F. Gilligan
Bowling Green	T. C. Cherry
Covington	G. O. Swing
Danville	L. C. Bosley
Dayton	E. M. Lamb
Fort Thomas	D. W. Bridges
Frankfort	J. W. Ireland
Henderson	C. E. Dudley
Hopkinsville	Arkley Wright
Lexington	Guy Whitehead
Louisville	L. R. Gregory
Madisonville	Harper Gatton
Mayfield	K. R. Patterson
Maysville	John Shaw
Middlesboro	J. W. Bradner
Newport	A. D. Owens
Owensboro	J. L. Foust
Paducah	L. J. Hanifan
Richmond	W. F. O'Donnell
Winchester	E. F. Birckhead
Louisiana	
Alexandria	W. J. Avery
Baton Rouge	W. B. Hatcher
Bogalusa	M. O. Rudolph
Crowley	J. M. Baker
Gretna	J. C. Ellis
Houma	H. L. Bourgeois
Lafayette	J. W. Faulk
Lake Charles	Ward Anderson
Minden	E. S. Richardson
Monroe	E. L. Neville
Morgan City	L. A. Law
New Iberia	L. G. Porter
New Orleans	Nicholas Bauer
Shreveport	

City	Superintendent
Maine	
Auburn	G. R. Gardner
Augusta	F. W. Burrill
Bangor	I. W. Small
Bath	C. D. Wilson
Belfast	H. S. Read
Biddeford	C. A. Weed
Brewer	H. R. Houston
Brunswick	Sherman Graves
Calais	F. C. English
Caribou	G. M. Carter
Gardiner	A. R. Carter
Houlton	T. P. Packard
Lewiston	C. W. Bickford
Oldtown	W. O. Chase
Portland	W. B. Jack
Presque Isle	A. B. Hayes
Rockland	E. L. Toner
Rumford	L. E. Williams
Saco	H. C. Hull
Sanford	J. A. Hamlin
Skowhegan	W. B. Woodbury
South Portland	L. W. Gerrish
Waterville	C. E. Glover
Westbrook	W. H. S. Ellingwood
Maryland	
Annapolis	George Fox
Baltimore	D. E. Weglein
Cambridge	J. B. Noble
Cumberland	C. L. Kopp
Frederick	G. L. Palmer
Frostburg	C. L. Kopp
Hagerstown	B. J. Grimes
Salisbury	J. M. Bennett
Massachusetts	
Abington	C. A. Record
Adams	R. A. Smith
Agawam	B. J. Phelps
Amesbury	R. R. Barr
Amherst	J. O. Cook
Andover	H. C. Sanborn
Arlington	C. A. Moody
Athol	W. S. Ward
Attleboro	L. A. Fales
Belmont	F. A. Scott
Beverly	S. H. Chace
Boston	J. E. Burke
Braintree	C. E. Fisher
Bridgewater	C. C. Putney
Brockton	J. F. Scully
Brookline	O. C. Gallagher
Cambridge	M. E. Fitzgerald
Canton	A. S. Ames
Chelmsford	G. S. Wright
Chelsea	G. C. Francis
Chicopee	J. J. Desmond, Jr.
Clinton	T. F. Gibbons
Concord	W. A. Hall
Danvers	I. G. Smith
Dartmouth	A. R. Paull
Dedham	J. C. Anthony
Dracut	C. L. Randall
Easthampton	H. D. Casey
Easton	G. C. Mann
Everett	Fairfield Whitney
Fairhaven	C. F. Prior
Fall River	H. L. Belisle
Fitchburg	J. M. McNamara
Framingham	B. J. Merriam
Franklin	A. W. Hale
Gardner	F. T. Reynolds
Gloucester	E. W. Fellows
Grafton	A. S. Cole
Great Barrington	R. H. Bellows
Greenfield	F. W. Porter
Haverhill	A. L. Barbour
Hingham	O. K. Collins
Holyoke	W. R. Peck
Hudson	B. D. Brown
Ipswich	J. I. Horton
Lawrence	B. M. Sheridan
Leominster	W. H. Perry
Lexington	T. S. Grindle
Lowell	H. J. Molloy
Ludlow	R. D. Tucker
Lynn	H. S. Gruver
Malden	F. G. Marshall
Mansfield	L. L. Woods
Marblehead	F. H. Hill
Marlboro	E. P. Carr
Maynard	C. H. Walker
Medford	H. H. Howes
Melrose	H. H. Stuart
Methuen	L. H. Conant
Middleboro	J. S. Cushing
Milford	A. O. Caswell
Millbury	C. C. Ferguson
Milton	H. F. Turner
Montague	J. S. Keating
Natick	C. R. Hall
Needham	J. C. Davis
New Bedford	A. P. Keith
Newburyport	S. M. King
Newton	U. G. Wheeler
North Adams	G. C. Bowman
Northampton	F. K. Congdon
North Andover	F. E. Pitkin
North Attleboro	G. W. Morris
Northbridge	H. J. Phipps
Norwood	L. W. Grant
Orange	E. C. Hempel
Palmer	C. H. Hobson
Peabody	Albert Robinson
Pittsfield	J. F. Gannon
Plymouth	A. B. Handy
Quincy	J. N. Muir
Reading	A. L. Safford
Revere	C. F. Lindstol
Rockland	R. S. Esten
Salem	G. M. Bemis
Saugus	J. W. Lambert
Somerville	E. W. Ireland
Southbridge	F. E. Corbin
South Hadley	F. E. Whittemore
Spencer	I. H. Agard
Springfield	Z. E. Scott
Stoneham	C. E. Varney
Stoughton	F. A. Morris
Swampscott	H. F. Dow
Taunton	W. A. Mowry
Uxbridge	A. B. Garcelon
Wakefield	W. B. Atwell
Walpole	F. L. Mansur
Waltham	W. H. Slayton
Ware	W. R. Barry
Watertown	W. H. Price
Webster	J. A. Lobban
Wellesley	S. M. Graves
Westboro	J. H. Armstrong
Westfield	C. D. Stiles
West Springfield	J. R. Fausey
Weymouth	P. T. Pearson
Whitman	F. E. Holt
Winchendon	G. W. Vail
Winchester	J. J. Quinn
Winthrop	E. R. Clarke
Woburn	G. I. Clapp
Worcester	W. S. Young
Michigan	
Adrian	C. H. Grifley
Albion	Don Harrington
Alma	F. R. Phillips
Alpena	G. H. Curtis
Ann Arbor	O. W. Haisley
Battle Creek	W. G. Coburn
Bay City	G. L. Jenner
Benton Harbor	S. C. Mitchell
Bessemer	C. R. Cobb
Cadillac	B. C. Shankland
Calumet	E. J. Hall
Charlotte	E. H. Chapelle
Cheboygan	Carl Titus
Coldwater	J. T. Symons
Detroit	Frank Cody
Dowagiac	A. H. Robertson
Escanaba	R. E. Cheney
Flint	C. V. Courter
Grand Haven	E. H. Babcock
Grand Rapids	L. A. Butler
Hamtramck	M. R. Keyworth
Hastings	D. A. Van Buskirk
Highland Park	I. M. Allen
Hillsdale	L. P. Holliday
Holland	E. E. Fell
Ionia	A. A. Rather
Iron Mountain	M. B. Travis
Ironwood	DuFay R. Rice
Ishpeming	C. L. Phelps
Jackson	E. O. Marsh
Kalamazoo	E. H. Drake
Lansing	J. W. Sexton
Ludington	H. E. Waits
Manistee	Benjamin Klager
Manistique	A. F. Hall
Marquette	W. M. Whitman
Menominee	J. L. Silvernale
Midland	J. J. Schafer
Monroe	C. W. Crandell
Mount Clemens	L. W. East
Munising	H. A. Wood
Muskegon	J. A. Craig
Muskegon H'ghts	W. R. Booker
Negaunee	H. S. Doolittle
Niles	F. W. Crawford
Owosso	E. J. Willman
Petoskey	H. C. Spitler
Pontiac	J. H. Harris
Port Huron	L. A. Packard
River Rouge	A. McDonald
Royal Oak	Frank Hendry
Saginaw	C. F. Miller
St. Joseph	E. P. Clarke
Sault Ste. Marie	G. G. Malcolm
Sturgis	C. M. Ferner
Three Rivers	C. H. Carrick
Traverse City	C. L. Poor
Wyandotte	F. W. Frostic
Ypsilanti	A. G. Erickson
Minnesota	
Albert Lea	A. L. Gaarder
Austin	S. T. Neveln
Bemidji	J. W. Smith
Brainerd	W. C. Cobb
Chisholm	J. P. Vaughan
Cloquet	E. B. Anderson
Crookston	Arnold Gloor
Duluth	Leonard Young
Eveleth	D. B. Heller
Faribault	H. H. Kirk
Fergus Falls	A. T. Stolen
Hibbing	J. W. Richardson
Little Falls	E. C. Van Dusen
Mankato	H. H. Eelkema
Moorhead	S. G. Reinertsen
New Ulm	F. B. Andreen
Owatonna	J. J. Skinner
Red Wing	G. V. Kinney
Rochester	G. H. Sanberg
St. Cloud	R. H. Brown
St. Paul	S. O. Hartwell
South St. Paul	I. T. Simley
Stillwater	G. D. Smith
Virginia	W. G. Bolcom
Willmar	A. M. Wisness
Winona	R. B. Irons
Mississippi	
Biloxi	A. L. May
Clarksdale	H. B. Heidelberg
Columbus	C. N. Brandon
Corinth	C. L. Crawley
Greenville	E. E. Bass
Greenwood	W. C. Williams
Gulfport	B. F. Brown
Hattiesburg	W. I. Thames
Jackson	E. L. Bailey
Laurel	R. H. Watkins
McComb	J. E. Gibson
Meridian	H. M. Ivy
Natchez	W. H. Braden
Pascagoula	B. P. Russum
Tupelo	C. F. Capps
Vicksburg	J. P. Carr
Yazoo City	R. L. Bedwell
Missouri	
Brookfield	L. V. Crookshank
Cape Girardeau	J. A. Whiteford
Carthage	J. L. Campbell
Chillicothe	G. E. Dille
Clinton	Arthur Lee
Columbia	W. I. Oliver
De Soto	O. T. Coil
Fulton	J. T. Bush
Hannibal	L. McCartney
Independence	E. B. Street
Jefferson City	W. F. Knox
Joplin	J. A. Koontz
Kansas City	George Melcher
Kirksville	J. H. Neville
Maplewood	J. Richmond
Marshall	W. M. Westbrook
Mexico	L. B. Hawthorne
Moberly	M. F. Beach

City	*Superintendent*
Nevada	E. A. Elliott
Poplar Bluff	G. R. Loughead
St. Charles	Stephen Blackhurst
St. Joseph	F. H. Barbee
St. Louis	H. J. Gerling (acting)
Sedalia	H. U. Hunt
Springfield	H. P. Study
Trenton	W. H. McDonald
University City	Charles Banks
Webb City	D. R. McDonald
Webster Groves	W. A. Gore
Montana	
Anaconda	W. K. Dwyer
Billings	A. T. Peterson
Bozeman	D. S. Williams
Butte	A. H. Douglass
Great Falls	I. W. Smith
Havre	W. J. Shirley
Helena	R. O. Evans
Kalispell	W. D. Swetland
Lewistown	C. G. Manning
Livingston	B. A. Winans
Miles City	G. G. Eye
Missoula	I. B. Fee
Nebraska	
Beatrice	A. L. Burnham
Columbus	R. R. McGee
Fairbury	W. E. Scott
Fremont	A. H. Waterhouse
Grand Island	C. R. Gates
Kearney	O. A. Wirsig
Lincoln	M. C. Leffer
Nebraska City	G. G. Warren
Norfolk	H. B. Simon
North Platte	W. J. Braham
Omaha	J. H. Beveridge
Scottsbluff	E. L. Weaver
York	Conrad Jacobson
Nevada	
Reno	B. D. Billinghurst
New Hampshire	
Berlin	C. M. Blair
Claremont	A. B. Kellog
Concord	L. J. Rundlett
Conway	J. H. Fuller
Derry	Carl Cotton
Dover	J. E. Wignot
Franklin	F. S. Libbey
Keene	W. C. T. Adams
Laconia	J. S. Gilman
Lebanon	W. J. English
Manchester	L. P. Benezet
Nashua	C. H. Noyes
Portsmouth	H. L. Moore
Rochester	W. H. Buker
Somersworth	H. L. Winslow
New Jersey	
Asbury Park	A. E. Kraybill
Atlantic City	C. B. Boyer
Bayonne	P. H. Smith
Belleville	G. R. Gerard
Bloomfield	E. S. Stover
Boonton	M. B. Mann
Bound Brook	A. S. Davis
Bridgeton	Chester Robbins
Burlington	V. H. Smith
Camden	J. E. Bryan
Carteret	Barbara V. Hermann
Cliffside Park	G. F. Hall
Clifton	G. J. Smith
Collingswood	J. B. Ritter
Dover	R. S. Bowlby
East Orange	C. J. Scott
East Rutherford	F. J. Oglee
Elizabeth	I. T. Chapman
Englewood	W. J. White
Fort Lee	A. E. Chase
Garfield	W. H. Steegar
Gloucester City	John C. Groome
Guttenberg	Mrs. Anna L. Klein
Hackensack	W. A. Smith
Haddonfield	A. S. Martin
Hammonton	H. H. Smith
Harrison	C. A. McGlennon
Hawthorne	F. H. Thoms
Hoboken	D. S. Kealey
Irvington	R. L. Saunders
Jersey City	J. A. Nugent
Kearny	Hermann Dressel
Lodi	H. V. Matthews
Long Branch	C. T. Stone
Madison	W. B. Davis
Millville	Homer Bortner
Montclair	F. G. Pickell
Morristown	J. B. Wiley
Newark	J. H. Logan
New Brunswick	F. J. Sickles
North Bergen	M. F. Husted
North Plainfield	B. R. Terhune
Nutley	P. R. Radcliffe
Orange	W. B. Patrick
Passaic	F. S. Shepherd
Paterson	J. R. Wilson
Penns Grove	Merritt Jenkins
Perth Amboy	W. C. McGinnis
Phillipsburg	G. A. Kipp
Plainfield	F. W. Cook
Pleasantville	S. M. Horstick
Princeton	Mabel T. Vanderbilt
Rahway	F. W. Little
Red Bank	E. C. Gilland
Ridgefield Park	A. R. Palmer
Ridgewood	I. W. Travell
Roselle	J. R. Patterson
Roselle Park	E. F. Smith
Rutherford	C. A. Fetterly
Salem	A. J. Dohner
Secaucus	M. J. Pechtel
Somerville	T. L. Brooks
South Amboy	O. O. Barr
South Orange	J. H. Bosshart
South River	W. S. Lesh
Summit	J. B. Dougall
Trenton	W. J. Bickett
Union City	A. O. Smith
Vineland	H. W. Weidner
Wallington	E. O. Harding
Weehawken	R. E. Pinkham
Westfield	C. A. Philhower
West New York	H. L. Bain
West Orange	S. C. Strong
Woodbury	M. G. Thomas
New Mexico	
Albuquerque	John Milne
Raton	D. W. MacKay
Roswell	D. N. Pope
Santa Fe	Isabel L. Eckles
New York	
Albany	C. E. Jones
Amsterdam	W. H. Lynch
Auburn	G. F. Barford
Batavia	C. P. Wells
Beacon	E. D. Hewes
Binghamton	D. J. Kelly
Buffalo	E. C. Hartwell
Canandaigua	F. E. Fisk
Cohoes	Edward Hayward
Corning	W. E. Severn (Dist. 9) A. M. Blodgett (Dist. 13)
Cortland	F. E. Smith
Depew	J. M. Barker
Dunkirk	F. R. Darling
Elmira	H. O. Hutchinson
Endicott	H. H. Crumb
Fredonia	C. R. Dye
Freeport	J. W. Dodd
Fulton	G. R. Bodley
Geneva	W. L. Houseman
Glen Cove	H. H. Chapman
Glens Falls	A. W. Miller
Gloversville	H. W. Langworthy
Hastings-upon-Hudson	J. L. Hopkins
Haverstraw	A. P. Burroughs
Hempstead	T. P. Calkins
Herkimer	Loraine W. Bills
Hornell	H. S. Dodge
Hudson	M. C. Smith
Hudson Falls	D. R. Finley
Ilion	E. P. Watkin
Ithaca	F. D. Boynton
Jamestown	M. J. Fletcher
Johnson City	H. B. Eccleston
Johnstown	E. L. Ackley
Kingston	M. J. Michael
Lackawanna	W. J. Breen
Lancaster	F. L. Smith
Little Falls	H. D. Hervey
Lockport	R. B. Kelley
Malone	H. H. Lamberton
Mamaroneck	A. Z. Boothby
Massena	A. W. Fortune
Mechanicville	E. E. Jones
Medina	H. E. Brown
Middletown	E. H. Burdick
Mount Vernon	W. H. Holmes
Newark	F. N. Stroup
Newburgh	S. J. Gage
New Rochelle	Albert Leonard
New York	W. J. O'Shea
Niagara Falls	J. F. Taylor
North Tarrytown	C. A. Benedict
N'rth Tonawanda	D. E. Batcheller
Norwich	F. R. Wassung
Ogdensburg	A. J. Laidlaw
Olean	W. C. Greenawalt
Oneida	A. H. Covell
Oneonta	G. J. Dann
Ossining	E. A. Barto
Peekskill	P. R. Spencer
Plattsburg	G. M. Elmendorf
Port Chester	A. G. Frost
Port Jervis	A. H. Naylor
Poughkeepsie	W. C. Moon
Rensselaer	W. S. Clark
Rochester	H. S. Weet
Rockville Center	W. S. Covert
Rome	G. R. Staley
Rye	G. E. Webster
Salamanca	G. A. Place
Saranac Lake	H. V. Littell
Saratoga Springs	Harris Crandall
Schenectady	W. H. Pillsbury
Seneca Falls	Hubert Mott
Solvay	C. A. Duvall
Syracuse	G. C. Alverson
Tarrytown	L. V. Case
Tonawanda	W. S. Fraser
Troy	Neil K. White (Lansingburg dist.) Arvie Eldred (Union dist.)
Utica	J. A. De Camp
Walden	E. R. Van Kleeck
Watertown	R. C. Burdick
Watervliet	William Richmond
Waverly	P. C. Meserve
Whitehall	P. E. Cole
White Plains	J. W. Lumbard
Yonkers	L. F. Hodge
North Carolina	
Asheville	W. L. Brooker
Burlington	C. C. Haworth
Charlotte	H. P. Harding
Concord	A. S. Webb
Durham	F. M. Martin
Elizabeth City	J. A. Jones
Fayetteville	Harry Howell
Gastonia	W. P. Grier
Goldsboro	Ray Armstrong
Greensboro	G. B. Phillips
Greenville	J. H. Rose
Henderson	E. M. Rollins
Hickory	R. W. Carver
High Point	T. W. Andrews
Kinston	W. A. Graham
Lexington	J. H. Cowles
New Bern	H. B. Smith
Raleigh	H. F. Srygley
Reidsville	F. M. Arrowood
Rocky Mount	R. M. Wilson
Salisbury	E. J. Coltrane
Statesville	R. M. Gray
Thomasville	D. W. Maddox
Washington	H. M. Roland
Wilmington	O. A. Hamilton
Wilson	K. R. Curtis
Winston-Salem	R. H. Latham
North Dakota	
Bismarck	H. O. Saxvik
Devils Lake	Nelson Sauvain
Fargo	J. G. Moore
Grand Forks	John C. West
Jamestown	C. L. Robertson
Minot	L. A. White
Ohio	
Akron	Thomas W. Gosling
Alliance	B. F. Stanton
Ashland	E. L. Bowsher
Ashtabula	M. S. Mitchell

City	Superintendent
Athens	A. F. Hixson
Barberton	U. L. Light
Bellaire	J. V. Nelson
Bellefontaine	S. A. Frampton
Bellevue	C. M. Carrick
Bowling Green	D. C. Bryant
Bucyrus	E. N. Dietrich
Cambridge	Hugh R. Hick
Campbell	W. M. Coursen
Canton	Jesse H. Mason
Chillicothe	W. L. Miller
Cincinnati	Edward D. Roberts
Circleville	J. O. Eagleson
Cleveland	R. G. Jones
Cleveland Hts.	Frank L. Wiley
Columbus	J. G. Collicott
Conneaut	C. M. Dickey
Coshocton	A. C. Pence
Cuyahoga Falls	W. H. Richardson
Dayton	Paul C. Stetson
Defiance	E. W. Howey
Delaware	R. D. Conrad
Delphos	E. W. Bell
Dennison	W. H. Angel
Dover	S. O. Mase
E. Cleveland	W. H. Kirk
E. Liverpool	Herbert G. Means
E. Palestine	C. E. Palmer
Elyria	R. C. Maston
Findlay	I. F. Matteson
Fostoria	L. A. BuDahn
Fremont	C. A. Hudson
Galion	J. F. Bemiller
Gallipolis	Wayne Lutz
Girard	E. O. Trescott
Greenville	C. L. Bailey
Hamilton	D. R. Baker
Ironton	Harper C. Pendry
Jackson	H. L. Bates
Kent	W. A. Walls
Kenton	D. B. Clark
Lakewood	Julius E. Warren
Lancaster	J. J. Phillips
Lima	R. E. Offenhauer
Logan	C. F. Ridgley
Lorain	D. J. Boone
Mansfield	C. A. Waltz
Mariette	H. L. Sullivan
Marion	George A. Bowman
Martins Ferry	W. L. Kocher
Massillon	Harry R. Gorrell
Middletown	R. W. Solomon
Mt. Vernon	A. W. Elliott
Nelsonville	H. E. Zuber
Newark	Oren J. Barnes
N'w Philadelphia	F. P. Geiger
Niles	R. J. Kiefer
Norwalk	C. C. Patterson
Norwood	C. W. Johnson
Painesville	C. C. Pierce
Piqua	George C. Dietrich
Portsmouth	Frank Appel
Ravenna	O. E. Pore
St. Bernard	F. M. Reynolds
St. Marys	C. C. McBroom
Salem	John S. Alan
Sandusky	F. J. Prout
Shelby	R. I. Lewis
Sidney	H. A. Hartman
Springfield	F. M. Shelton
Steubenville	Robert L. Erwin
Struthers	H. S. Floyd
Tiffin	C. A. Krout
Toledo	Charles S. Meek
Troy	T. E. Hook
Uhrichsville	H. B. Galbraith
Urbana	Charles W. Cookson
Van Wert	U. E. Diener
Wapakoneta	M. R. Menschel
Warren	H. B. Turner
W'hington C. H.	Claude A. Bruner
Wellston	W. G. Scarberry
Wellsville	S. E. Daw
Wilmington	H. W. Hodson
Wooster	George C. Maurer
Xenia	Louis F. Hammerle
Youngstown	John J. Richeson
Zanesville	C. T. Prose
Oklahoma	
Ada	I. S. Hinshaw
Ardmore	J. J. Godbey
Bartlesville	C. O. Haskell
Blackwell	A. J. Lovett
Chickasha	T. T. Montgomery
Cushing	J. E. Hickman
Drumright	Frank D. Hess
Durant	G. T. Stubbs
El Reno	H. F. Allen
Enid	E. D. Price
Guthrie	W. A. Greene
Henryetta	Edwin O. Shaw
Hugo	H. V. Posey
Lawton	B. C. Swinney
McAlester	M. J. Hale
Miami	Clyde H. O'Dell
Muskogee	C. K. Reiff
Norman	Elmer Capshaw
Oklahoma City	J. R. Barton
Okmulgee	J. R. Holmes
Pawhuska	J. O. Hall
Picher	Paul L. Heilman
Ponca City	W. W. Isle
Sapulpa	W. M. Chambers
Shawnee	H. G. Faust
Tulsa	Merle C. Prunty
Vinita	A. O. Martin
Oregon	
Astoria	A. C. Hampton
Baker	Hugh Coleman
Bend	G. W. Ager
Corvallis	H. W. Adams
Eugene	H. R. Goold
La Grande	J. T. Longfellow
Medford	E. H. Hedrick
Oregon City	R. W. Kirk
Pendleton	Austin Landreth
Portland	Charles A. Rice
Salem	George W. Hug
The Dalles	C. W. Boetticher
Pennsylvania	
Allentown	H. W. Dodd
Altoona	Robert E. Laramy
Ambridge	Samuel Fausold
Archbald	W. A. Kelly
Arnold	Donald P. Davis
Ashland	Edward W. Taylor
Ashley	John T. Gibbons
Avalon	S. Todd Perley
Bangor	O. W. Ackerman
Beaver Falls	Floyd Atwell
Bellevue	J. Nelson Mowls
Berwick	M. E. Houck
Bethlehem	W. H. Weiss
Blakely	H. B. Anthony
Bloomsburg	W. W. Raker
Braddock	Thomas G. McCleary
Bradford	James F. Butterworth
Bristol	Howard E. James
Butler	John A. Gibson
Canonsburg	F. W. McVay
Carbondale	James J. Crane
Carlisle	J. W. Potter
Carnegie	Norman L. Glasser
Chambersburg	U. L. Gordy
Charleroi	Thomas L. Pollock
Chester	David A. Ward
Clairton	H. D. Teal
Clearfield	George E. Zerfoss
Coaldale	J. E. Gildea
Coatesville	Carl O. Benner
Columbia	Paul E. Witmeyer
Connellsville	Bela B. Smith
Conshohocken	Robert C. Landis
Coraopolis	J. C. Werner
Corry	Ralph S. Dewey
Crafton	L. F. Brunk
Danville	E. B. Cline
Darby	W. R. Douthett
Dickson	P. M. Brennan
Donora	Thomas M. Gilland
Dormont	Ralph Radcliffe
DuBois	C. J. Alderfer
Dunmore	James R. Gilligan
Duquesne	C. H. Wolford
Duryea	John J. Joyce
E. Conemaugh	F. B. Snowden
Easton	James C. Bay
E. Pittsburgh	Charles F. Young
Edwardsville	V. E. Lewis
Ellwood City	W. Ray Smith
Erie	John C. Diehl
Etna	William M. Stewart
Farrell	W. W. Irwin
Ford City	Quincy G. Vincent
Forest City	Jules J. Kerl
Frackville	W. R. Trautman
Franklin	C. E. Carter
Freeland	N. P. Luckenbill
Glassport	John S. Hart
Greensburg	Thomas S. March
Greenville	G. B. Gerberich
Hanover	James W. Pace
Harrisburg	C. H. Garwood
Hazleton	A. D. Thomas
Homestead	Port Eckles
Huntingdon	E. R. Barclay
Indiana	Norman C. Koontz
Jeannette	E. W. Long
Jersey Shore	Frank H. Painter
Johnsonburg	C. E. Wilson
Johnstown	James Killius
Kane	R. D. Welch
Kingston	C. B. Hanyen
Kittanning	Clyde W. Cranmer
Lancaster	H. E. Gress
Lansford	E. M. Balsbaugh
Larksville	Falconer R. Gilbert
Latrobe	John G. Hulton
Lebanon	S. O. Rorem
Lehighton	Bert B. David
Lewistown	Charles S. Coxe
Lock Haven	J. F. Puderbaugh
Luzerne	Arthur E. Booth
McKeesport	Joseph B. Richey
McKees Rocks	T. K. Johnston
Mahanoy City	H. A. Oday
Marcus Hook	Gordon E. Groff
Meadville	Warren P. Norton
Middletown	H. J. Wickey
Midland	H. V. Herlinger
Millvale	C. C. Williamson
Minersville	C. E. Roudabush
Monessen	C. R. McClelland
Monongahela	John H. Dorr
Mount Carmel	Wilbur M. Yeingst
Mount Oliver	Minnie Ubinger
Mount Pleasant	John C. Haberlen
Munhall	Charles R. Stone
Nanticoke	A. P. Diffendafer
Nanty Glo	Harry E. Hogue
New Brighton	S. W. Lyons
New Castle	Clyde C. Green
New Kensington	Ernest T. Chapman
Norristown	H. O. Dietrich
Northampton	C. S. Frankenfield
N. Braddock	F. DeWitt Zuerner
Oil City	R. A. Baum
Old Forge	B. T. Harris
Olyphant	John A. Dempsey
Palmerton	J. N. Roeder
Philadelphia	Edwin C. Broome
Phoenixville	Martin L. Peters
Pitcairn	C. C. Pearsall
Pittsburgh	William M. Davidson
Pittston	D. J. Cray
Plymouth	H. S. Jones
Pottstown	F. Herman Fritz
Pottsville	Clarence E. Toole
Punxsutawney	F. S. Jackson
Rankin	C. L. Wilson
Reading	Amanda E. Stout
Renovo	J. A. Bowser
Ridgway	W. M. Pierce
Rochester	Denton M. Albright
St. Clair	Charles R. Birch
St. Marys	J. J. Lynch
Sayre	L. E. DeLaney
Schuylkill H'v'n	Charles C. Madeira, Jr.
Scottdale	S. B. Bulick
Scranton	John H. Dyer
Shamokin	Joseph Howerth
Sharon	W. D. Gamble
Sharpsburg	J. J. Donovan
Shenandoah	A. J. Ratchford
Steelton	Charles S. Davis
Stroudsburg	Robert Brown
Summit Hill	E. T. McCready
Sunbury	Walter A. Greesey
Swissvale	C. C. Kelso
Swoyerville	Joseph H. Finn
Tamaqua	F. G. Horner
Tarantum	A. D. Endsley
Taylor	William S. Robinson
Throop	John J. O'Hara

City	Superintendent
Titusville	G. A. Stetson
Turtle Creek	W. A. Rodgers
Tyrone	W. W. Eisenhart
Uniontown	Milton D. Proctor
Vandergrift	Charles H. Omo
Warren	P. W. M. Pressel
Washington	J. C. Stiers
Waynesboro	J. Clair McCullough
West Chester	Walter L. Phillips
West Hazleton	E. S. Teter
West Pittston	R. J. W. Templin
Wilkes-Barre	H. H. Zeiser
Wilkinsburg	William C. Graham
Williamsport	A. M. Weaver
Wilmerding	Charles W. Shaffer
Windber	J. W. Hedge
Winton	James L. McCloskey
York	R. O. Stoops
Rhode Island	
Bristol	Elmer S. Mapes
Burrillville	Joseph C. Sweeney
Central Falls	James L. Hanley
Coventry	Richard Campbell
Cranston	John K. Fenner
Cumberland	Emma M. Caufield
E. Providence	James R. D. Oldham
Johnston	Everett C. Preston
Lincoln	John L. Smith
Newport	Herbert W. Lull
No. Providence	Harold T. Lowe
Pawtucket	William A. Newell
Providence	A. J. Stoddard
So. Kingstown	E. K. Wilcox
Warren	Leroy G. Staples
Warwick	Warren Sherman
Westerly	Willard H. Bacon
West Warwick	John F. Deering
Woonsocket	James F. Rockett
South Carolina	
Anderson	E. C. McCants
Charleston	A. B. Rhett
Chester	Myron E. Brockman
Columbia	A. C. Flora
Florence	John W. Moore
Gaffney	W. C. Taylor
Greenville	J. L. Mann
Greenwood	W. E. Black
Newberry	O. B. Cannon
Orangeburg	A. J. Thackston
Rock Hill	R. C. Burts
Spartanburg	Frank Evans
Sumter	S. H. Edmunds
Union	T. C. Jolly, Jr.
South Dakota	
Aberdeen	Charles L. Dalthorp
Huron	Andrew J. Lang
Lead	R. V. Hunkins
Mitchell	John C. Lindsey
Rapid City	E. B. Berquist
Sioux Falls	A. A. McDonald
Watertown	H. Mackenzie
Yankton	C. A. Beaver
Tennessee	
Bristol	Ralph B. Rubins
Chattanooga	W. T. Robinson
Clarksville	C. H. Moore
Cleveland	R. T. Allen
Columbia	R. L. Harris
Dyersburg	C. M. Walker
Jackson	C. B. Ijams
Johnson City	C. E. Rogers
Kingsport	Ross N. Robinson
Knoxville	H. P. Shepherd
Memphis	R. L. Jones
Morristown	Carl T. Vance
Murfreesboro	J. C. Mitchell
Nashville	J. J. Keyes (acting)
Texas	
Abilene	R. D. Green
Amarillo	W. A. McIntosh
Austin	A. N. McCallum
Beaumont	M. E. Moore
Belton	P. B. Baker
Bonham	W. T. White
Brenham	M. B. Holleman
Brownsville	G. W. Gotke
Brownwood	E. J. Woodward
Bryan	Harry L. Durham
Burkburnett	Butler Westerfield
Childress	A. W. Adams
Cisco	J. J. Youngblood
Cleburne	Emmett Brown
Corpus Christi	Mary Carroll
Corsicana	H. D. Fillers
Dallas	N. R. Crozier
Del Rio	J. C. Cochran
Denison	F. B. Hughes
Eagle Pass	B. H. Miller
Eastland	P. B. Bittle
El Paso	A. H. Hughey
Ennis	Newton W. McCann
Fort Worth	M. H. Moore
Gainesville	H. O. McCain
Galveston	E. G. Littlejohn
Greenville	L. C. Gee
Hillsboro	W. F. Doughty
Houston	E. E. Oberholtzer
Laredo	Wm. P. Galligan
Longview	Henry L. Foster
McAllen	John H. Gregory
McKinney	J. S. Carlisle
Marshall	E. C. Deering
Mineral Wells	R. H. Brannan
Navasota	L. G. Andrews
Orange	E. B. Stover
Palestine	Bonner Frizzell
Paris	J. G. Wooten
Port Arthur	G. M. Sims
Ranger	R. F. Holloway
San Angelo	Felix E. Smith
San Antonio	B. W. Hartley
San Benito	Thomas J. Yoe
Sherman	L. T. Cook
Sulphur Springs	W. L. Willis
Taylor	R. H. Brister
Temple	L. C. Procter
Terrell	J. E. Langwith
Texarkana	W. H. Stilwell
Tyler	J. M. Hodges
Vernon	W. T. Lofland
Victoria	V. L. Griffin
Waco	B. B. Cobb
Waxahachie	G. B. Winn
Weatherford	T. W. Stanley
Wichita Falls	J. W. Cantwell
Yoakum	L. B. McGuffin
Utah	
Brigham	C. H. Skidmore
Logan	Louis A. Petersen
Ogden	W. Karl Hopkins
Provo	Charles A. Smith
Salt Lake City	George N. Child
Vermont	
Barre	Carroll H. White
Bennington	D. W. McClelland
Brattleboro	Florence M. Wellman
Montpelier	S. C. Hutchinson
Rockingham	Francis M. Malcolm
Rutland	W. W. Fairchild
St. Albans	Josiah S. McCann
St. Johnsbury	S. C. Harding
Springfield	Ernest G. Ham
Virginia	
Alexandria	R. C. Bowton
Bristol	Roy B. Bowers
Charlottesville	James G. Johnson
Clifton Forge	Herman Blankinship
Covington	J. G. Jeter
Danville	G. L. H. Johnson
Fredericksburg	H. G. Brown
Hampton	Robert M. Newton
Harrisonburg	W. H. Keister
Lynchburg	E. C. Glass
Newport News	J. H. Saunders
Norfolk	C. W. Mason
Petersburg	Henry G. Ellis
Portsmouth	Harry A. Hunt
Pulaski	E. L. Darst
Richmond	Albert H. Hill
Roanoke	D. E. McQuilkin
So. Norfolk	R. H. Pride
Staunton	L. F. Shelburne
Suffolk	John E. Martin
Winchester	H. S. Duffey
Washington	
Aberdeen	G. B. Miller
Anacortes	G. W. Greene
Bellingham	D. E. Wiedman
Bremerton	Tillman Peterson
Centralia	C. L. Littel
Everett	R. E. Cook
Hoquiam	H. C. Crumpacker
Olympia	E. L. Breckner
Port Angeles	C. W. Hodge
Puyallup	W. H. Grayum
Seattle	T. R. Cole
Spokane	O. C. Pratt
Tacoma	W. F. Geiger
Vancouver	C. W. Shumway
Walla Walla	W. M. Kern
Wenatchee	G. M. Warren
Yakima	A. C. Davis
West Virginia	
Bluefield	E. C. Wade
Charleston	F. L. Teal
Clarksburg	J. A. Jackson (city district)
	M. P. Boyles (coal district)
Elkins	Walter Riddle
Fairmont	O. G. Wilson
Grafton	H. A. Rice
Huntington	C. L. Wright
Keyser	J. C. Sanders
Martinsburg	L. W. Burns
Morgantown	C. E. McCorkle
Moundsville	J. C. Shreve
Parkersburg	H. E. Odgers
Princeton	Wilford McCutcheon
Weston	J. R. Hall
Wheeling	D. B. Kraybill
Williamson	F. R. Hanifan
Wisconsin	
Antigo	R. E. Balliette
Appleton	B. J. Rohan
Ashland	I. O. Hubbard
Baraboo	A. C. Kingsford
Beaver Dam	W. R. Davies
Beloit	F. E. Converse
Chippewa Falls	R. F. Lohrie
Cudahy	A. L. Prodoehl
De Pere	T. J. McGlynn
Eau Claire	P. G. W. Keller
Fond Du Lac	L. P. Goodrich
Green Bay	H. F. Sutton
Janesville	L. R. Creutz
Kaukauna	J. F. Cavanaugh
Kenosha	G. F. Loomis
La Crosse	G. M. Wiley
Madison	R. W. Bardwell
Manitowoc	H. S. Bonar
Marinette	C. E. Hulten
Marshfield	R. F. Lewis
Menasha	J. E. Kitowski
Menomonie	W. G. Ballentine
Merrill	G. F. Brooks
Milwaukee	M. C. Potter
Neenah	C. F. Hedges
Oshkosh	C. C. Bishop
Portage	A. J. Henkel
Racine	F. M. Longanecker
Rhinelander	W. F. Kruschke
Sheboygan	H. W. Kircher
So. Milwaukee	H. E. Smith
Stevens Point	P. M. Vincent
Stoughton	S. H. Berg
Superior	Lulu L. Pickett
Two Rivers	F. G. Bishop
Watertown	R. A. Buell
Waukesha	G. O. Banting
Wausau	S. B. Tobey
Wauwatosa	W. T. Darling
West Allis	T. J. Jones
Wisconsin R'pids	Julius Winden
Wyoming	
Casper	R. S. Hicks
Cheyenne	A. S. Jessup
Laramie	A. A. Slade
Rock Springs	E. M. Thompson
Sheridan	J. J. Early

Section XVI

AIDS AVAILABLE TO LOCAL SCHOOL BOARDS FROM STATE DEPARTMENTS

Participation of State Departments of Education and Other State Agencies in Planning and Supervising Local School-Building Development

IN the planning of buildings for a public school system, it frequently is desirable to know the degree to which the state department of education has provided for participation and cooperation. The following summary segregates the character of the supervision given by the state and its representative agencies under three headings. The first item indicates the action which the state board may be expected to take. The second item shows the part played by the state superintendent of schools as the official spokesman of the state department of education. In the third part will be found indications of the assistance or guidance which other state agencies will give. The form of tabulation has necessitated the abbreviation of the statements covering these responsibilities, but the degree and character of participation are clearly shown in each state.

ABBREVIATED STATEMENT OF STATES' PARTICIPATION IN SCHOOL-BUILDING CONSTRUCTION

ALABAMA

State Board of Education, Montgomery
Approves rules and regulations for the hygienic, sanitary, and protective construction of school buildings.
State Superintendent, Dr. A. F. Harman
1. Prepares and submits to state board rules and regulations for hygienic, sanitary, and protective construction of school buildings.
2. Recommends for condemnation buildings that violate these regulations.

State Architect, A. F. Dittmar

ARIZONA

State Board of Education, Phoenix
No jurisdiction whatever in regard to buildings erected by districts.
State Superintendent, Dr. C. O. Case
Other Agencies
Board of health issues regulations.

ARKANSAS

State Board of Education, Little Rock
Has a division of school grounds and schoolhouse planning.
Director—
Prepares plans for 1- to 6-teacher buildings.
Prepares school ground plans.
Checks architect's plans.
Advises school officials.
State supervisor visits local units upon invitation.
State Superintendent, Dr. J. P. Womack
No legal provision for approval.
Supervisor of School Buildings, J. O. Baker

CALIFORNIA

State Superintendent of Public Instruction, Vierling Kersey
Division of schoolhouse planning passes on all plans costing more than $5,000, excepting those in the largest cities; is called into consultation by city districts, and controls other situations by surveys.
Site sizes and locations controlled by state standards.
No building contract legal without Department's approval.
This Department does not make working drawings.
Chief of Division of Schoolhouse Planning, Andrew P. Hill, Jr.

COLORADO

State Superintendent of Public Instruction, Dr. Katherine L. Craig
School building handled by local boards of education.

CONNECTICUT

State Board of Education, Hartford
Has a bureau of building construction and maintenance which approves plans, though not because law requires it. Chief inspects school buildings for safety.
Publishes standards for guidance of local boards.
Has consulting architect to whom plans are referred, though not by law.
Assists local communities in building surveys.
State Commissioner, Dr. A. B. Meredith

DELAWARE

State Board of Education, Dover
Outside Wilmington prepares a tentative program of school building to submit to local boards.
Hears comments and suggestions thereon.
Creates standards with effect of law, governing hygienic, sanitary, and protective construction; selection, arrangement, and maintenance of sites; condemns school buildings.
Has approval of plans and specifications.
State Superintendent, Dr. H. V. Holloway
Other Agencies
Legislature has created a state school-building act.
There is a state school-building account.
State school-building commission for each district.
Plans approved by State Board of Education and commission.
Buildings built by commission.
Construction supervised by commission.
Board of health has to approve drinking water and sewage disposal.

DISTRICT OF COLUMBIA

Superintendent of Schools, Frank W. Ballou
Local Board of Education passes on all plans for school buildings. These plans are submitted by the office of the Municipal Architect.
First Assistant Superintendent is in charge of buildings and grounds. This officer consults with the office of the Municipal Architect on matters pertaining to plans for buildings and improvement of grounds. He also advises with school officials and submits written reports to the Committee on Buildings, Grounds and

Equipment of the Board of Education. This officer inspects all school buildings and is in charge of repairs and improvements. He is the liaison officer between the schools and the municipal government in matters pertaining to the physical welfare of the schools.

Other Agencies

The Health Officer of the District of Columbia issues reports on the sanitary inspection of buildings.

Representatives of the Fire Department of the District of Columbia visit the school buildings regularly for the protection of the schools.

Municipal Architect, Albert L. Harris

FLORIDA

State Superintendent of Public Instruction, Dr. W. S. Cawthon

Has oversight, charge, and management of all matters pertaining to public schools, school buildings and grounds.

GEORGIA

State Superintendent of Schools, Dr. Mell L. Duggan

Furnishes plans and specifications for school-building guidance in local units.

Supervisor of schoolhouse construction prepares plans for 1- to 4-teacher buildings; prepares school ground plans; checks architect's plans; advises school officials.

Other Agencies

County superintendent and county board of education approve plans.

Supervisor of Schoolhouse Planning, J. O. Martin

IDAHO

State Board of Education, Boise

Standardization of:
- Sanitary appliances
- School furniture
- School equipment and supplies
- School buildings

Issues plans for 1-, 2-, 3-room buildings.

Requires approval of all plans.

State Commissioner, Dr. W. D. Vincent

Other Agencies

Department of public welfare has to cooperate with state board of education in its duties regarding schools.

County superintendent has power to require local trustees to conform to rules of state board "if there is money enough."

County board of health is responsible for sanitation in schools.

ILLINOIS

State Superintendent of Public Instruction, Dr. Francis G. Blair

Prepares, with advice of state board of health, state architect, and state fire marshal, specifications for minimum requirements in heating, ventilation, lighting, seating, water-supply, toilets, safety against fire.

These have force of law.

Other Agencies

State architect is required to assist the state superintendent of schools.

Enforcement of law is in the hands of county superintendents and local authorities.

County superintendent approves plans according to standards of state board.

Advises school officials in details of construction, but only on standards is it necessary to follow him.

County superintendent inspects buildings.

Board of education required to submit plans to county superintendent.

INDIANA

State Superintendent of Public Instruction, Dr. Roy P. Wisehart

Other Agencies

Local school trustees erect buildings. Plans and specifications must be submitted to state board of health for approval of sanitation and hygiene; to state board of accounts for adequacy of specifications and fair competition.

State board of health issues standards.

IOWA

State Superintendent of Public Instruction, Dr. Agnes Samuelson

Shall prepare and publish, when deemed necessary, a pamphlet containing suitable plans and specifications.

KANSAS

State Board of Education, Topeka

"No provision in the laws to prevent the erection of undesirable buildings or to compel the discontinuance of buildings that should be abolished immediately, further than plans for all new school buildings must be submitted to the state architect as to provision for fire protection according to law." Chap. 16, Revised School Laws of Kansas for 1927.

Has adopted standardization of rural schools involving among other things: out-building; school-building equipment; and the school building itself.

State Superintendent, Dr. George A. Allen, Jr.

Criticizes and approves plans submitted voluntarily by local authorities.

State Architect, J. W. Radotinsky

KENTUCKY

State Board of Education, Frankfort

Approves plans made by state superintendent and issues same for local community's guidance.

State Superintendent, Dr. W. C. Bell

With advice of board of health, prepares plans for approval of state board comprehending sanitary and protective construction.

Approves plans submitted by county boards and boards of trustees of graded schools.

Other Agencies

Advisory with state superintendent.

LOUISIANA

State Superintendent of Education, Dr. T. H. Harris

Approves plans which board of health regulations require submitting to him.

Other Agencies

Board of health regulations require submittal of plans to:
- Parish superintendent of schools
- State superintendent of schools
- Parish health officer

for hygienic or necessary provision for ventilation, heating, light, fire protection.

MAINE

State Commissioner of Education, Bertram E. Packard

No school building can be built or repaired without his approval.

Provides plans for 1- to 4-room buildings free of cost.

Issues minimum requirements so that local units will be able to meet his approval of plans.

Other Agencies

No school building can be built or repaired without approval of board of health.

MARYLAND

State Board of Education, Annapolis

Elementary schools. Standardization includes grounds, buildings, lighting, heating and ventilation, library, equipment.

Has issued "Standards for School Buildings" as a guide to county superintendents.

State Superintendent, Dr. Albert S. Cook

Sites and plans must be submitted to him for approval; additions to buildings also.

Issues certificate without which no building can be erected (except Sec. 20, Chap. 506, 1916).

Comprehends size and arrangement.

Other Agencies

Plans must be submitted to board of health for approval of sewage-disposal arrangements and plumbing.

MASSACHUSETTS

State Commissioner of Education, Dr. Payson Smith

Assistants of superintendent do much in consulting with local committees. Loan slides.

Other Agencies

Department of public safety must approve all plans.

Department of public safety issues regulations.

MICHIGAN

State Department of Public Instruction, Lansing

Must approve all plans and specifications for new school buildings, additions to school buildings, or the remodeling of old school buildings.

Has issued standards.

Makes surveys, free of cost, of local situations before local board has decided what program should be, upon invitation.

State Superintendent, Dr. Webster H. Pearce

Has authority to inspect and condemn.

MINNESOTA

State Board of Education, St. Paul

State aid for building of consolidated schools.

Prescribes rules for schoolhouse construction, including therein rules of the board of health relative to sanitary standards for toilets, water-supply, and disposal of sewage.

State Commissioner, Dr. James M. McConnell
Examines all plans and specifications with power of approval or otherwise.
He may condemn buildings under his own or the high school board's rules.
Other Agencies
The law authorizes county superintendent to advise local school boards in regard to buildings and ventilation, but, as a matter of fact, the county superintendent does not exercise this power. All such questions come to commissioner of education.
Director, Division of Buildings and Sanitation, Samuel A. Challman

MISSISSIPPI

State Department of Education, Jackson
Has a Division of School Building Service. This division:
Cooperates in making surveys on the effective organization of schools.
Makes surveys to determine building needs.
Outlines building programs.
Approves architects' plans and specifications for school buildings.
Furnishes free plans and specifications for some small school buildings, teachers' homes and accessory buildings.
General advisory service on school-plant planning and equipment and on the effective use of the school plant.
State Superintendent, Dr. W. F. Bond

MISSOURI

State Department of Education, Jefferson City
The state is a member of the National Council of Schoolhouse Construction. Blue prints, plans and specifications are furnished free of charge by the Department, through its connection with the National Council of Schoolhouse Construction. This work is only advisory.
Supervisor of Schoolhouse Construction, O. G. Sanford
Advises with school boards concerning the construction of the proper type of school buildings.
State Superintendent, Dr. Charles A. Lee

MONTANA

State Board of Education, Helena
Publishes a bulletin on 1- and 2-room rural buildings, containing drawings and plans.
State Superintendent, Dr. Elizabeth Ireland
Plans are furnished local boards by the board of health.

NEBRASKA

State Superintendent of Public Instruction, Dr. Charles W. Taylor

NEVADA

State Department of Education
Prepares plans and specifications for rural school buildings and distributes same.
State Superintendent, W. W. Anderson

NEW HAMPSHIRE

State Board of Education, Concord
State Commissioner, Dr. Ernest W. Butterfield
Interprets meaning of "suitable and sanitary" buildings for all schools. Has general authority to make regulations. Cooperates with superintendents and local school boards in planning buildings.
Recommends to state board of health investigation of unsuitable buildings.
Other Agencies
State board of health, on complaint, may condemn or order buildings improved at expense of districts.

NEW JERSEY

State Department of Public Instruction, Trenton
Advice and consent to appointment of building inspector by commissioner.
Approves plans which must be submitted.
Has set up a code.
Has a business division with superintendent and director of school buildings.
State Commissioner, Dr. Charles H. Elliott
May instruct county and city superintendents as to constructing schoolhouses and furnishing same.
Appoints an inspector of buildings.
Other Agencies
County superintendent has power "to note" conditions of schoolhouses, sites, etc., and advise with local boards in respect to construction, heating and ventilation, and lighting.
Local boards provide school buildings.
Commissioner of charities and corrections shall examine and report on school buildings at request of commissioner of education.
Inspector of School Buildings, G. L. Kupp

NEW MEXICO

State Superintendent of Public Instruction, Dr. Atanasio Montoya

NEW YORK

State Education Department, Albany
Has a division of school buildings and grounds with a chief.
Has set up standards.
Board issues a pamphlet of information for local authorities.
Makes inspections of sites and school conditions before definite action is taken by local authority.
Advises with superintendent, principals, and boards in regard to needs and best way to meet them.
Examines preliminary plans.
State Commissioner, Dr. Frank P. Graves
In cities of 3rd class, all plans and specifications must receive commissioner's approval.
He cannot approve unless plans conform to laws.
No tax can be levied until plans are approved.
Director of School Buildings and Grounds Division, Joseph H. Hixson

NORTH CAROLINA

State Board of Public Instruction, Raleigh
Has a director of schoolhouse planning.
There is a special building fund from which loans are made when plans are approved.
State department has a set of standards.
Has plans purchased from architects which it distributes free.
Has an assistant who devotes much time to the laying out, planting and beautifying of school grounds.
State Superintendent, Dr. A. T. Allen
All plans must be submitted to state superintendent for approval, except in special charter schools.
Other Agencies
Plans must also be submitted to insurance commission for approval, also to state board of health.
Director of Schoolhouse Planning, John J. Blair

NORTH DAKOTA

State Superintendent of Public Instruction, Bertha R. Palmer
Plans must be submitted to and approved by superintendent.

OHIO

State Department of Education, Columbus
Director of surveys is provided, whose services may be given to determine the building needs of any district, and to check proposed building plans.
State Director of Education, Dr. J. L. Clifton
Other Agencies
Has a state building code (very elaborate).
All plans must be approved by chief inspector of workshops and factories, except in cities having regularly organized building inspection departments.
District health commissioner checks plans for water-supply and sanitary arrangements. State department of health may make surveys and issue orders as to these matters.

OKLAHOMA

State Superintendent of Public Instruction, Dr. John Vaughan
Prepares complete plans and specifications for the construction of all school buildings for four teachers or less, costing less than $10,000.
Makes school-building survey for all sized buildings.
Approves plans of all sizes, but approval is not required by law.
Other Agencies
Standard building laws.
Book of 300 plans in hands of each county superintendent in the state.
Director of Schoolhouse Planning, Haskell Pruett

OREGON

State Superintendent of Education, C. A. Howard
Issues booklet giving suggested plans for 1-, 2-, and 3-room school buildings. No legal provision for the approval of the state department.
Other Agencies
Plans for 1-room schools must be approved by county school superintendents.
County superintendents advise with the school boards relative to the construction, warming, ventilating, and arrangement of schoolhouses.

PENNSYLVANIA

State Department of Public Instruction, Harrisburg
Has a director of bureau of school buildings.
Prescribes rules and regulations and has power to take such action as it may deem expedient to promote physical and moral welfare of school children.
Department code—
Required to approve plans in 2nd, 3rd, 4th class districts.
Supervises preparation of plans in local communities if asked to do so.
Submits, if asked, suggestive sketches.
State Superintendent, Dr. John A. H. Keith
Other Agencies
State code.
Art commission passes on architectural design.
Department of labor and industry passes on fire and panic protection.
Director, Bureau of School Buildings, Hubert C. Eicher

RHODE ISLAND

State Commissioner of Education, Dr. Walter E. Ranger
Commissioner has printed pictures and plans in his annual report.

SOUTH CAROLINA

State Superintendent of Education, Dr. James H. Hope
Plans must be submitted to and approved by the Director of Schoolhouse Planning.
The Director inspects all plans and new buildings, and certificate of approval is necessary before same can be used.
Other Agencies
Has a state building code.
Director of Schoolhouse Planning, S. P. Clemons

SOUTH DAKOTA

State Department of Vocational Education, Pierre
Assists in advisory capacity in the planning of school buildings; also helps boards in various ways to show their communities the needs of new buildings and additions.
State Superintendent of Public Instruction, E. C. Giffen
Plans must be approved by him, and show heating and ventilation scheme.

TENNESSEE

State Commissioner of Education, Dr. P. L. Harned
Division of Schoolhouse Planning and Construction furnishes plans to boards desiring to build.

TEXAS

State Department of Education, Austin
Special state aid fund.
State Superintendent, Dr. S. M. N. Marrs
Other Agencies
School-building code.
Plans must be submitted as follows for approval: (1) in a common school district—to the county superintendent; (2) independent district and city or town—to superintendent of schools.
These agencies report to state department what they have done and transmit evidence.
State Director of School Plant Division, J. Fred Horn
Prepares plans for 1- to 6-teacher buildings, and suggestive sketches for larger buildings; advises school officials; checks architects' plans; makes school-building surveys upon invitation; visits local units upon invitation.

UTAH

Conditions reported uncertain

State Board of Education, Salt Lake City
There are two department building codes.
First is in abeyance though not exactly discarded.
They have operated under the second one 2 years.
State Superintendent, Dr. C. N. Jensen
Is required to formulate a code to govern preparation of plans by local communities.
May hire an architect to examine plans or inspect buildings.

VERMONT

State Board of Education, Montpelier
Rural schools are standardized with "points" on buildings, grounds, equipment.
Plans "should be" submitted to state board.
Issues plans and pictures.
State Commissioner, Dr. Clarence H. Dempsey
Other Agencies
Plans "must be" submitted to board of health.

VIRGINIA

State Board of Education, Richmond
Has a division of school buildings.
Prepares plans and specifications for smaller towns and cities.
Supervises construction free of charge.
Minimum standards have been set up and approved.
Cooperates with local boards in:
(a) Preparing preliminary plans.
(b) Getting out final plans.
(c) Present at opening of proposals.
(d) Inspection every 2 weeks during first stages of construction, additional upon request of contractor or local board.
State Superintendent, Dr. Harris Hart
State Director, Division of Buildings, Raymond V. Long

WASHINGTON

State Board of Education
Has been given "some power" through law on "wider use of school plant."
State Superintendent, Dr. N. D. Showalter
Other Agencies
County superintendents approve plans in 2nd and 3rd class districts.

WEST VIRGINIA

State Board of Education
In districts with population less than 5,000, plans must be submitted for approval to board or its agent.
State Superintendent of Free Schools, Dr. George M. Ford

WISCONSIN

State Department of Public Instruction, Madison
Under a cooperative agreement between the industrial commission and the department, all school plans are sent to the latter by the commission for checking and suggestive criticisms looking towards the erection of first class buildings.
Helps local communities by making suggestive plans for all types of buildings to serve as a basis for extended work by commercial architects.
Service has been extended to cover expert advice on heating, ventilation, lighting.
The department develops complete plans and specifications and gives architectural service for 1- and 2-room rural schools on request.
Inspects all types of schools with a view to improving housing conditions and facilities; makes complete building surveys in all types of communities on request.
State Superintendent, John Callahan
Other Agencies
The law requires submission of all school plans to industrial commission. This checking refers primarily to the application of the state building code and pays attention primarily to construction, safety and sanitation.
Supervisor of Buildings, H. W. Schmidt

WYOMING

State Board of Education, Cheyenne
Prescribes standards which may include rules and regulations for the sanitary and hygienic construction of schoolhouses and the location and selection of grounds.
State Superintendent, Katherine A. Morton

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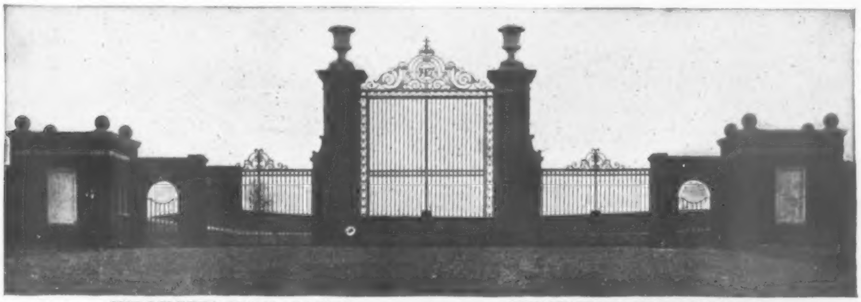

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Complete lighting equipment for the school stage or outdoor pageant: standard units or specially designed apparatus; theatrical lighting effects, apparatus and supplies; and spectacular and electro-mechanical effects.

Baby Hercules Spot and Flood Light (Illustrated at right)

This light is especially adapted to the small auditorium or theater. Hung in any position, it will turn in all directions, throwing light where desired and focusing on any chosen object, throwing it into bold relief.

The hood is constructed of stamped steel, finished in dull black. It is thoroughly ventilated at top, back, bottom and around the lens; carries a 250-watt concentrated filament Type G 30 lamp; has a 3¾-inch spherical reflector, spring clip device for color frame, sliding lamp base which allows adjustment of focus, and 5-inch imported condensing lens. The front of the light is detachable, giving ready access to the lamp, also converting the light from a spot to a floodlight.

Focusing Baby Spot Light (Illustrated at left)

Where spotlighting of mild intensity is desired, the Focusing Baby Spot Light is an efficient unit, either on a stand or for a small hanging spot. Its small size makes it easy to conceal. It has a 5-inch lens; medium receptacle on sliding base for focusing; adjustable mir-

ror reflector; 15-inch hood with ventilating areas at top, back, bottom and around lens; grooves for color frames.

Standard Mazda Spot Light

This light has hood of same size and design as the Standard Arc Spot Light, but replaces the arc burner with a Mazda lamp. It is accepted universally because of its flexibility, its small weight, its steady burning on either direct or alternating current, the facility with which the intensity of light can be controlled, and the accurate blending of colors by means of dimmers. The beam is concentrated where the light is actually required, thus eliminating all light waste. Spot lights are made in various sizes to accommodate the concentrated filament Mazda lamp ranging from 250 to 2000 watts.

Other Types

For other types of lights—including the Stand Type Aluminide Flood Light and Hanging Flood Lights, illustrated at top of page, see our complete "Catalog of Theatrical Lighting Equipment and Effects."

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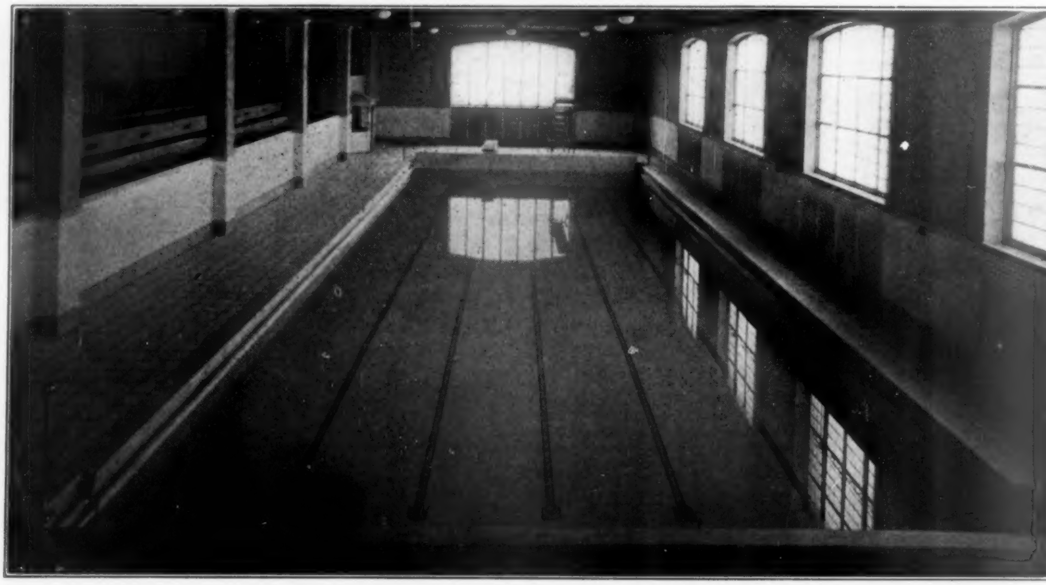
Florence, Mass.



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Hamline University, St. Paul, Minn.
Holyoke High School, Holyoke, Mass.
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Phillips Academy, Andover, Mass.
Ridgefield Park School, Ridgefield Park, N. J.
Rutgers College, New Brunswick, N. J.
State Normal School, Emporia, Kans.
State Normal School, Spearfish, S. D.
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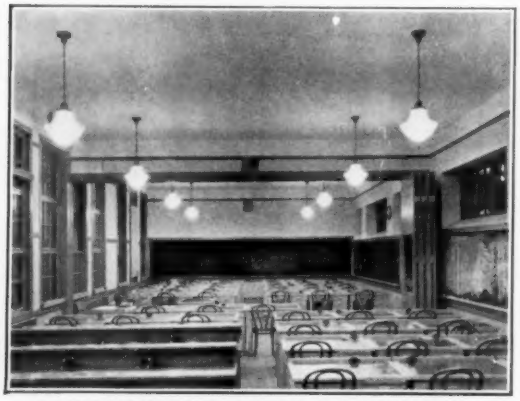

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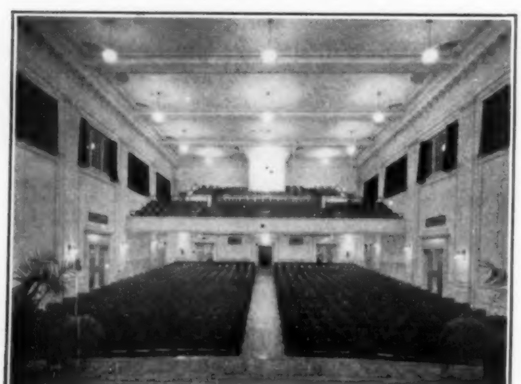
Lighted with Holophane Filterlite

DINING ROOM, MOUNT MARY COLLEGE MILWAUKEE, WISCONSIN
Lighted with Holophane Filterlite



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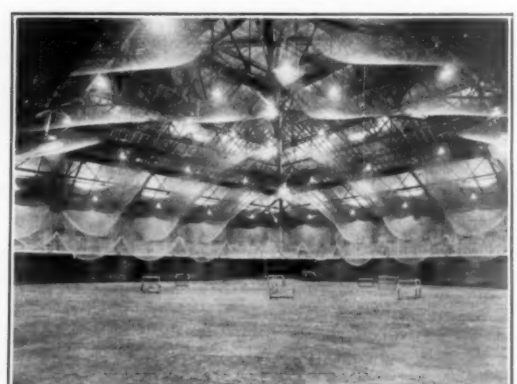

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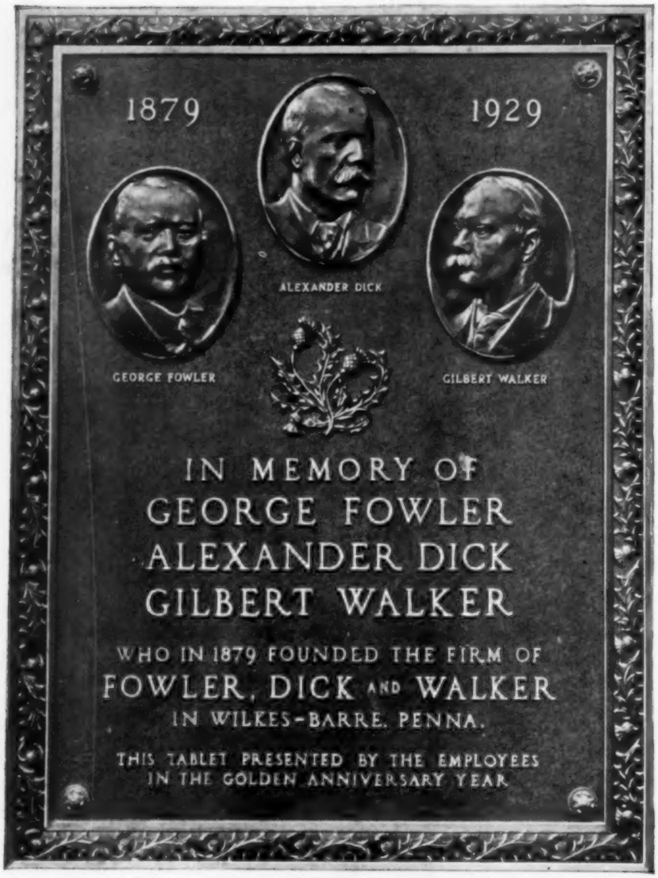
UNITED STATES BRONZE SIGN CO.

Bronze Tablets and Honor Rolls

233-235 Centre Street, New York City



BRONZE MEMORIAL TABLETS AND HONOR ROLLS

What better way is there to commemorate some great event in the annals of your school or college, or to honor the memory of a beloved college president or school principal who has passed on, then to place a beautiful, imperishable memorial of bronze where all who enter your school can see it?

The United States Bronze Sign Company specializes in the design and execution of memorial tablets and honor rolls of bronze for schools, colleges, libraries, etc., and will be glad to submit sample designs, or to furnish a rough sketch in accordance with your suggestions, and to assist you in every way possible in obtaining the design that will be the most appropriate, as well as the most beautiful, for your purpose.

Our craftsmen are thoroughly competent to furnish designs from the simplest to the most elaborate, and to execute such designs with the greatest accuracy. If you prefer to send us your own design, they will give it the same careful, painstaking attention.

One thing more:—We are prepared to quote you prices that will compare favorably with any others. Our slogan is:

"Where the BEST cost LESS"

Let us know your requirements, and our artists will work up a simple, beautiful, appropriate design for you, and submit it for your consideration.

NATURAL SOUND AMPLIFYING SYSTEM, INC.

11 West 42nd Street, New York   1418 Walnut Street, Philadelphia

CENTRALIZED RADIO AND AMPLIFYING SYSTEMS FOR SCHOOLS AND COLLEGES

Among the various types of amplifying systems now offered by the Natural Sound Amplifying System, Inc., for the presentation of radio programs, phonograph records, speech and music in any number of classrooms as well as auditorium and gymnasium, are:

1. **The Single-Channel System** to amplify a single radio program, phonograph record, speech or musical program in any or all the rooms of the school building simultaneously.

2. **The Multi-Channel System** to amplify two or more programs simultaneously in any combination in any room grouping arrangement desired.

All N. S. A. Systems distribute programs originating in auditorium or elsewhere to any or all rooms as desired. **Changing from Radio to Record to Speech or Music is instantaneous.**

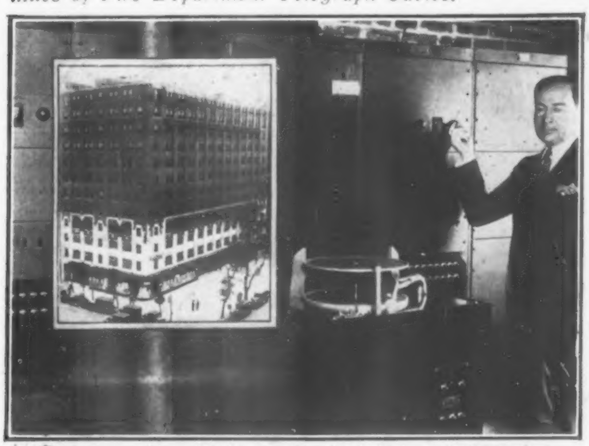
The Natural Sound Amplifying System is now in use in many large buildings and parks, most of the installations being of even greater size and scope than any school building would require. Three of our installations are illustrated on this page. Note the simplicity of control—which may be quickly learned by an inexperienced operator.

N.S.A.S. installations include a Phonograph Record Changing Machine which plays ten records automatically, in any sequence, allowing 17 seconds, or longer if desired, between selections.

Natural Sound Amplifying System, Inc., installed the most ambitious as well as largest amplifying system of its kind in the world for the City of New York—distributing the music of concert bands playing in Central Park, Manhattan, and Prospect Park, Brooklyn, to 25 other parks in five boroughs over approximately 1000 miles of Fire Department Telegraph Cables.

This control and equipment panel rack, installed for the City of Wildwood, N. J., provides for three simultaneous programs—radio, phonograph and speech or music—fully covering the North and South Beaches (a distance of more than two miles of beach and boardwalk) and the Convention Hall, which seats 5000.

Control and equipment panels in Park Central Hotel, Washington, providing choice of two programs in 320 apartments.



Two-channel amplifying system installed in Ambassador Hotel, Washington, D. C., serving 525 guest rooms, 4 public rooms, lobby, gymnasium and swimming pool with choice of Radio, Records, Speech and Music.

Upkeep: The upkeep of Natural Sound equipment is practically confined to the replacement of vacuum tubes, purchasable in any radio store. **No working parts to wear out. The system is all-electric, requiring no batteries or charging equipment.**

Wiring: The wiring is in no way involved—may be done by any electrical contractor—**includes provision for Television.**

Guarantee: We fully warrant the workmanship and material of Natural Sound apparatus and equipment for one year.

Note: Since each installation presents its own problems, we offer no standardized equipment. We fit the equipment to the job, not the job to the equipment. We sell complete installations only.

We shall be glad to furnish further information.